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February 28, 2006

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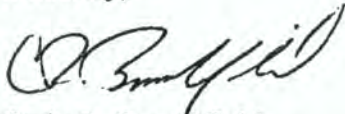
Re: W.G. Krummrich Plant In-Situ Thermal Desorption Mass Removal
Treatability Test Report

Dear Mr. Bardo,

Enclosed please find the In-Situ Thermal Desorption Mass Removal Treatability Test
Report for the W.G. Krummrich Facility.

I look forward to our meeting next week to discuss our results.

Sincerely,



Craig R. Branchfield
Manager, Remedial Projects

**In-Situ Thermal Desorption
Mass Removal Treatability Tests
W.G. KRUMMRICH FACILITY,
SAUGET, ILLINOIS**

February 28, 2006

Prepared for:



**Solutia Inc.
575 Maryville Centre Dr.
St. Louis, MO 63141**

Prepared by:



**TERRATHERM, INC.
356 Broad Street
Fitchburg, MA 01420**

PATENT NOTICE: Covered by one or more of the following U.S. patents: 4,984,594, 5,076,727, 5,114,497, 5,190,405, 5,221,827, 5,229,583, 5,244,310, 5,271,693, 5,318,116, 5,553,189, 5,656,239, 5,660,500, 5,997,214, 6,102,622, 6,419,423, 6,485,232, 6,543,539, 6,632,047, 6,824,328, 6,854,929, 6,881,009, 6,951,436, 6,962,466 and 7,004,678. Additional Patents Pending. All rights reserved.

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EXECUTIVE SUMMARY

TerraTherm, Inc.'s patented In-Situ Thermal Desorption (ISTD) technology, also known as In-Situ Thermal Destruction, is a soil remediation process in which heat and vacuum are applied simultaneously to subsurface soils. Heat flows into the soil primarily by thermal conduction from heaters situated inside vertical thermal wells operated at approximately 700-800°C, while a vacuum is applied to the treatment zone via all or a subset of the thermal wells. The target treatment temperature, attained at the midpoints between the heaters, depends on the contaminant and soil properties, but generally is between 100 and 325 °C. This technology is being evaluated for applicability and potential use at the W.G. Krummrich Facility.

Bench-scale treatability studies performed by an independent laboratory, Kemron Environmental Services, were designed to simulate the ISTD process and evaluate the degree of mass removal at various treatment temperatures to be achieved in between the thermal wells for two separate contaminant groups: polychlorinated biphenyls (PCBs) and mono and dichlorobenzenes (MCB/DCB). These studies were performed following the procedures and methods prescribed in the ISTD Work Plan – Mass Removal Treatability Study submitted to the EPA in May of 2005.

Three separate samples were collected and analyzed as part of this evaluation: 1) SHU Unsaturated PCB S0825 at 1.5 ft bgs, 2) SHU Unsaturated MCB/DCB SCTB-67 and DNAPL-K-4 at 9 ft. bgs and 3) SHU Saturated MCB/DCB DNAPL-K-4 at 16.5 ft bgs. All three samples were collected from the Shallow Hydrogeologic Unit (SHU), a low-permeability, silty/clayey fine sand with silt and clay lenses. One of the samples (SHU Unsaturated PCB S0825 @ 1.5 ft bgs) was collected in the Former PCB Manufacturing Area. The other two samples were collected in the Former Chlorobenzene Process Area

For the PCB treatment studies, aliquots of the sample collected from the Former PCB Manufacturing Area (2,447,000 µg/kg Total PCBs) were heated in an aerated cylindrical tube located inside a furnace to temperatures of 300, 350, and 425°C and held at their respective temperature for 72 hrs. Total PCB concentrations were reduced by 99.8 percent, > 99.9 percent and > 99.9 percent, respectively, with residual concentrations of 4,890, ND (640) and 8 µg/kg. Treatment at 425°C produced similar results as treatment at 350°C. It is reasonable to expect that most if not all of the biphenyls would have been removed at 300°C if a longer treatment time had been used (e.g., 144 hrs or 6 days).

For the MCB/DCB treatment studies, aliquots of both the unsaturated and saturated samples collected from the Former Chlorobenzene Process Area were heated in an aerated cylindrical tube located inside a furnace similar to the setup used for the PCB studies, however, target treatment temperatures of 100, 132 and 200°C were used to determine the effectiveness of thermal treatment on the removal of the MCB/DCB present in the soil. The samples were each held at their respective treatment temperature for 72 hrs. In an attempt to simulate field conditions at or below the water table, a hot moist air stream was fed into the saturated samples during their testing. A dry air stream was fed into the unsaturated samples during testing.

Thermal treatment was effective at removing MCB and DCB from unsaturated soil with an MCB/DCB pre-treatment concentration of 28,000,000 µg/kg. Removal efficiency improved slightly as a function of increasing treatment temperature with 99.8 percent, 99.9 percent and >



99.99 percent removal of MCB/DCB at temperatures of 100°C, 132°C and 200°C, respectively. Residual MCB/DCB concentrations were 32,410, 16,300 and 1,351 µg/kg, respectively.

Similar removal efficiencies and significantly lower post-treatment residual concentrations were achieved in the saturated soil samples, which had an MCB/DCB pre-treatment concentration of 2,440,000 µg /kg. Removal efficiency was > 99.9 percent for all three treatment temperatures (100°C, 132°C and 200°C) and residual concentrations were 62, 81.6 and 79 µg/kg, respectively.

In summary, the results of the thermal treatability study indicate the following:

- A treatment temperature of 300°C or higher reduced PCB concentrations in shallow, unsaturated soil samples from the Former PCB Manufacturing Area by at least 99.8 percent.
- A target treatment temperature of 100°C reduced MCB/DCB concentrations in both unsaturated and saturated soil samples from the Former Chlorobenzene Process Area by at least 99.8 percent.



1.0 INTRODUCTION

1.1 Project Description

TerraTherm, Inc. (TerraTherm) and its subcontractor, Kemron Environmental Services (Kemron), conducted a series of bench-scale treatability studies to determine the feasibility of using In-Situ Thermal Desorption (ISTD) to effectively remediate soils from both the Former PCB Manufacturing Area and the Former Chlorobenzene Process Area at the W.G. Krummrich (WKG) Facility in Sauget, IL. Soils from the Former PCB Manufacturing Area and Former Chlorobenzene Process Area are contaminated with polychlorinated biphenyls (PCBs) and mono- and dichlorobenzenes (MCB/DCB), respectively. These studies were performed following the procedures and methods prescribed in the ISTD Work Plan – Mass Removal Treatability Study submitted to the EPA in May of 2005.

1.2 Scope of Work

As previously mentioned, the scope of work of the treatability studies is described in detail in the Treatability Study Work Plan submitted to the EPA (May 2005). In summary this work, which is presented in this report, included the following:

- Homogenization of untreated material
- Physical characterization and chemical analysis of untreated material
- Spiking of untreated material from the Former Chlorobenzene Process Area with MCB and DCB to better represent historic maximum concentrations
- Chemical analysis of spiked material to establish pre-treatment concentrations
- Thermal treatment of samples from the Former PCB Manufacturing Area at 300°C, 350°C, and 425°C
- Thermal treatment of samples from the Former Chlorobenzene Process Area at 100°C, 132°C, and 200°C
- Post-treatment chemical analysis of the samples to determine chemical concentrations and removal efficiencies.

Appendix A of this report presents the Thermal Treatability Study report prepared by Kemron. The Kemron Treatability report provides a thorough discussion of all aspects of the treatability study and includes the laboratory analytical reports. To minimize redundancy, we refer the reader to the indicated Section names of the Kemron Treatability Report. In addition, Appendix B contains the Data Validation report prepared by Kemron for the laboratory analyses performed by STL – Savannah as part of this work.

2.0 UNTREATED MATERIAL HANDLING AND CHARACTERIZATION

Three separate samples were collected and analyzed as part of this thermal treatability study. Table 1 summarizes the samples collected from the facility and submitted for testing. Prior to performing the thermal treatability studies, pre-characterization analyses were performed on the samples to determine the physical characteristics and concentrations of compounds of concern (COCs).



Table 1. Summary of Samples Submitted for Thermal Treatability Testing.

Sample Name	Location	Depth	Sat/Unsat	Compounds of Concern
SHU* Unsaturated PCB SO825 @ 1.5 ft	Former PCB Manufacturing Area	1.5 ft bgs [†]	Unsaturated (above the water table)	PCBs
SHU Unsaturated MCB/DCB SCTB-67 @ DNAPL-K4 @ 9 ft	Former Chlorobenzene Process Area	9 ft bgs	Unsaturated (above the water table)	Mono- and dichlorobenzenes (MCB/DCB)
SHU Saturated MCB/DCB DNAPL-K4 @ 16.5 ft	Former Chlorobenzene Process Area	16.5 ft bgs	Saturated (below the water table)	Mono- and dichlorobenzenes (MCB/DCB)

*Shallow Hydrologic Unit; [†] below ground surface

Physical property analyses included: particle size analysis, falling head permeability, bulk density, dry density, moisture content, specific gravity, and saturation. These data were used to characterize the material collected from the facility and provide a basis for re-compacting the material following homogenization in the sample test cylinders. Section 2.0 of the Kemron Treatability Report (Appendix A) provides a thorough discussion of the findings of the characterization testing and how these data were used to prepare the composite samples for thermal treatability testing.

In addition to physical characterization, the samples were also analyzed for Compounds of Concern (COC). The following analyses were performed on material from each of the three samples following homogenization:

- VOCs – USEPA Method 8260B
- SVOCs – USEPA Method 8270C
- Extractable Organic Halogens – USEPA Method 9023

In addition, the untreated material collected from the Former PCB Manufacturing Area was also analyzed for PCB Homologues using USEPA Method 680.

3.0 COC SPIKING

Pre-treatment chemical analyses indicated that the concentrations of the COCs were less than the historic maximum concentrations detected from the two areas. Therefore, spiking of the samples with reagent grade COCs was performed in order to comply with the requirements of the work plan. Spiking the sample from the Former PCB Manufacturing Area was technically infeasible because of the amount of PCB required. Thus, only the samples from the Former Chlorobenzene Process Area were spiked with MCB and DCB. (Appendix A, Section 3.0)



Table 2 presents the results of the pre-treatment PCB characterization of the sample from the Former PCB Manufacturing Area and Table 3 presents the pre-treatment concentrations of MCB and DCB after spiking of the unsaturated and saturated samples from the Former Chlorobenzene Process Area.

Table 2. Results of Pre-Treatment Characterization of Sample from Former PCB Manufacturing Area.

PCB	Starting Concentrations µg/kg
Monochlorobiphenyl	<2,300
Dichlorobiphenyl	27,000
Trichlorobiphenyl	54,000
Tetrachlorobiphenyl	330,000
Pentachlorobiphenyl	480,000
Hexachlorobiphenyl	700,000
Heptachlorobiphenyl	550,000
Octachlorobiphenyl	230,000
Nonachlorobiphenyl	57,000
Decachlorobiphenyl	19,000 J
Total PCBs	2,447,000

Table 3. Results of Pre-Treatment Characterization Following MCB/DCB Spiking of Samples from Former Chlorobenzene Process Area.

COC	Unsaturated Sample	Saturated Sample	Analytical Method
Chlorobenzene (MCB)	14,000,000	560,000	VOC Analysis USEPA Method 8260B Average of Triplicates
1,2-Dichlorobenzene	6,000,000	1,100,000	
1,3-Dichlorobenzene	3,000,000	180,000	
1,4-Dichlorobenzene	5,000,000	620,000	
Total Dichlorobenzene (DCB)	14,000,000	1,900,000	

Both VOC (USEPA Method 8260B) and SVOC (USEPA Method 8270C) analyses were performed on triplicates of the MCB/DCB spiked samples. Based on review of the laboratory results and comparison of the two analytical methodologies, it was determined that the VOC analytical results provided a more accurate measurement of the actual concentration of the DCBs present in the samples. The VOC analyses consistently reported higher concentrations for the DCBs than the SVOC analyses in all cases. Therefore, the DCB concentrations based on the VOC analyses were used in the comparison of pre- and post-treatment results and evaluation of the effectiveness of thermal treatment.



4.0 THERMAL TREATMENT EVALUATIONS

The thermal testing was conducted using a Fisher Scientific Series 750 muffle furnace capable of reaching temperatures as high as 1,150°C (Figures 1, 2 and 3). Three thermal tests were conducted with the soil from the two areas (Appendix A, Sections 4.0, 5.0 and 6.0). Testing of the unsaturated PCB soil from the Former PCB Manufacturing Area was conducted at soil temperatures of 300, 350 and 425°C with a residence time of 72 hours. Testing of the unsaturated and saturated MCB/DCB soils from the Former Chlorobenzene Process Area was conducted at soil temperatures of 100, 132 and 200°C with a residence time of 72 hours.

Aliquots of the soil were placed into a stainless steel cylinder measuring approximately 15.24 cm (6 in) in length and 7.62 cm (3 in) in width (Figure 2). The tare weight of the reactor and the weight of the soil in the reactor was measured and recorded.

Before initiating the thermal test, the vessel with the site soil was placed in the furnace at ambient temperature. A temperature probe was placed through an opening in the roof of the furnace and into the soil for monitoring soil temperatures throughout the testing process (Figures 1 and 2).

Air inlet and outlet tubes were also placed through openings in the roof of the furnace and connected to opposite ends of the sample vessel to provide air flow through the sample during testing (Figures 1 and 2). The air flow simulated the flux of air through the soil within the treatment zone due to the vacuum extraction component of the ISTD system.

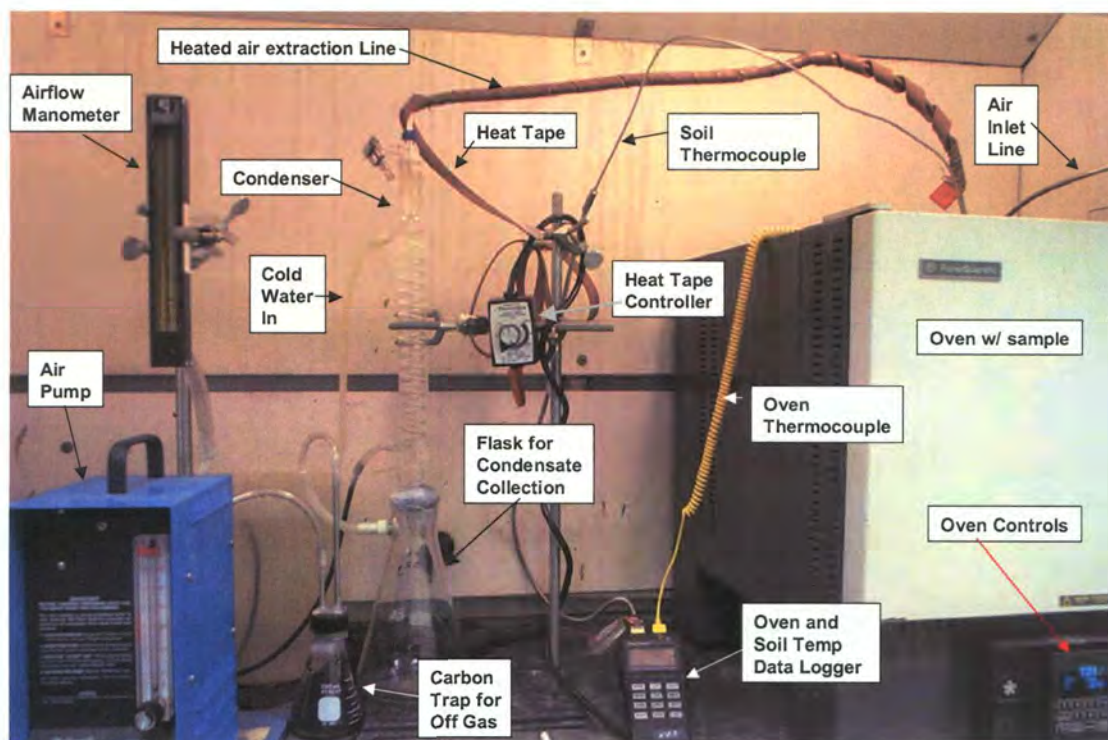


Figure 1. Thermal Treatment Setup.

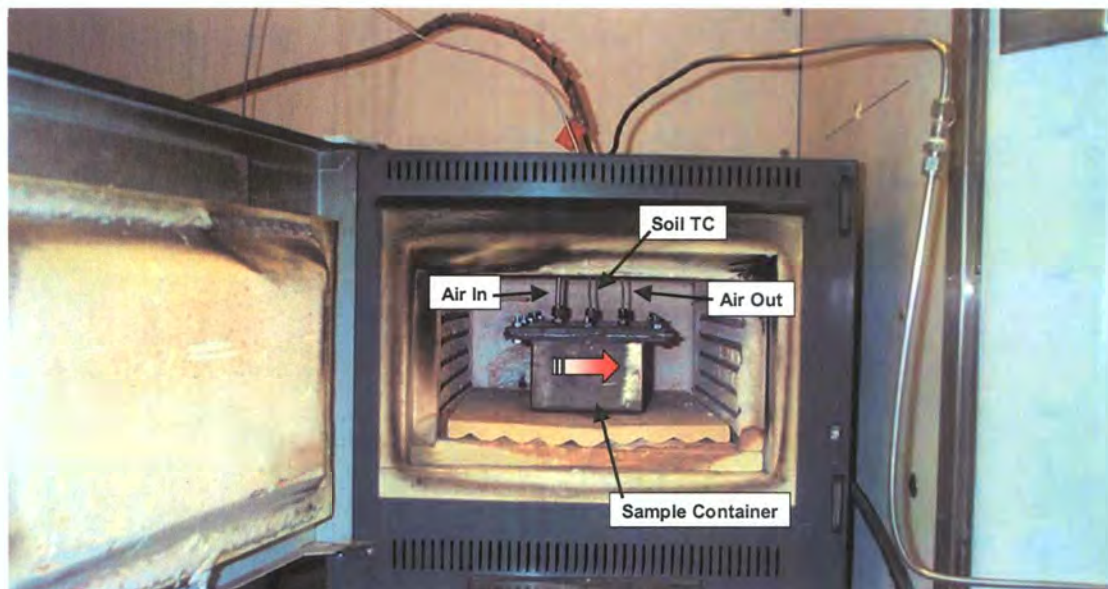


Figure 2. Cylinder Containing Soil Sample within Muffle Furnace.

The other end of the air inlet line was connected to a regulator that was attached to air supply tanks (Figure 1). A flow meter was placed on the air outlet line to monitor the air-flow rate. The regulator was adjusted to provide a constant air-flow rate of ~50 ml/min throughout each test. This air-flow rate has been shown to provide good simulation of full-scale air flow rates.

In order to simulate conditions at or below the water table, a hot moist air stream was fed into the saturated MCB/DCB samples from the Former Chlorobenzene Process Area during their testing. For all other tests, a dry air stream was fed into the sample chamber. Figures 3 and 4 present the setup used for the saturated testing.

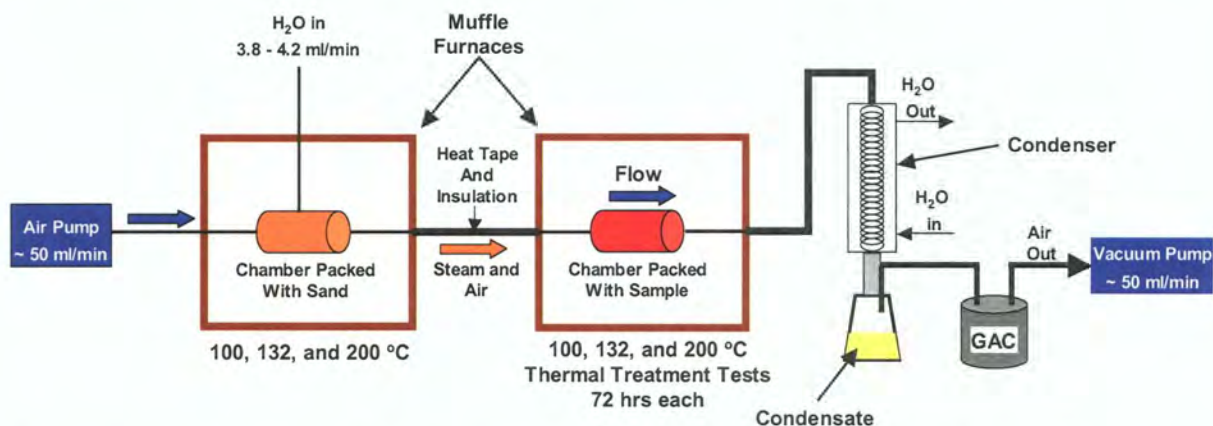


Figure 3. Setup Used for Thermal Treatment Testing Under Saturated Conditions.

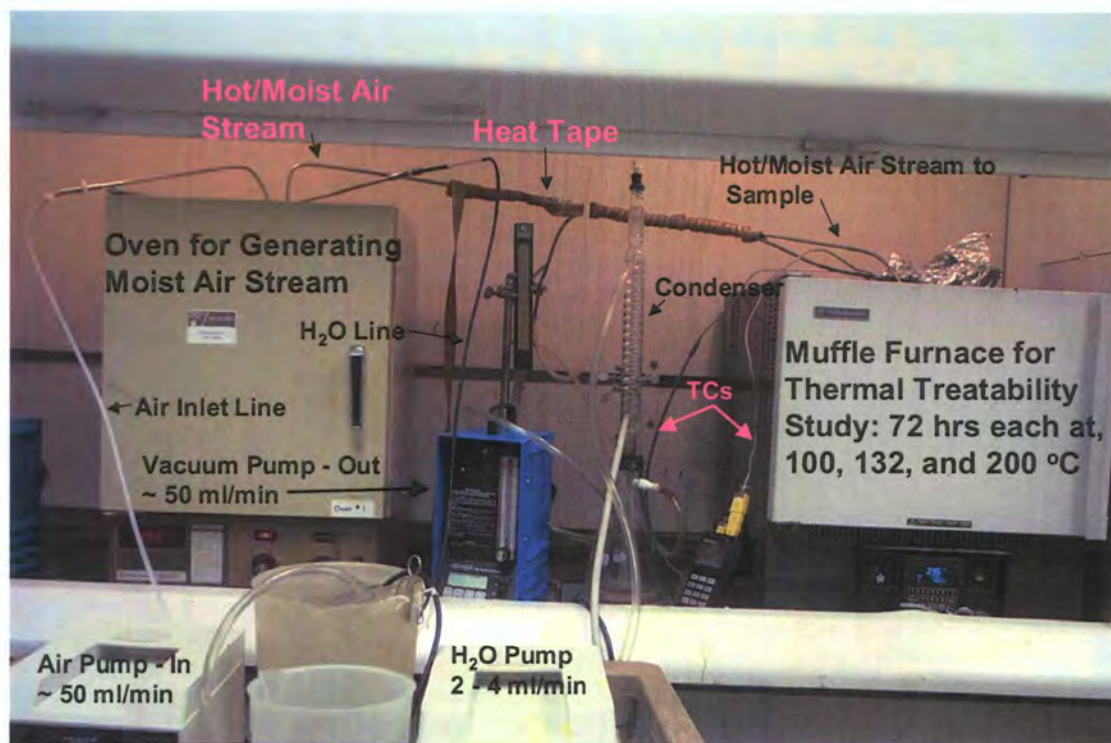


Figure 4. Saturated Thermal Treatment Testing

For each of the thermal treatability tests, the furnace temperature was first gradually brought up to the target soil treatment temperature. Once the soil achieved the target treatment temperature, thermal treatment was conducted for the specified residence time (72 hours). At the end of the treatment period, the vessel was removed from the furnace and allowed to rapidly cool to room temperature under a fume hood. The final weight of the pan and testing residuals were then measured and recorded prior to post-test sampling and analysis.

Throughout thermal testing, Kemron continuously monitored the temperature of the furnace chamber and the soil in the vessel (Figure 5). Temperature monitoring was performed while the furnace heated up to the target treatment temperature, throughout the duration of treatment, and while the testing residuals cooled to ambient conditions. Temperature monitoring was recorded at a maximum of five-minute intervals using a Digi-Sense dual-channel thermocouple with a data logger. This allowed temperature monitoring to be performed continuously. (Appendix A, Sections 4, 5, and 6).

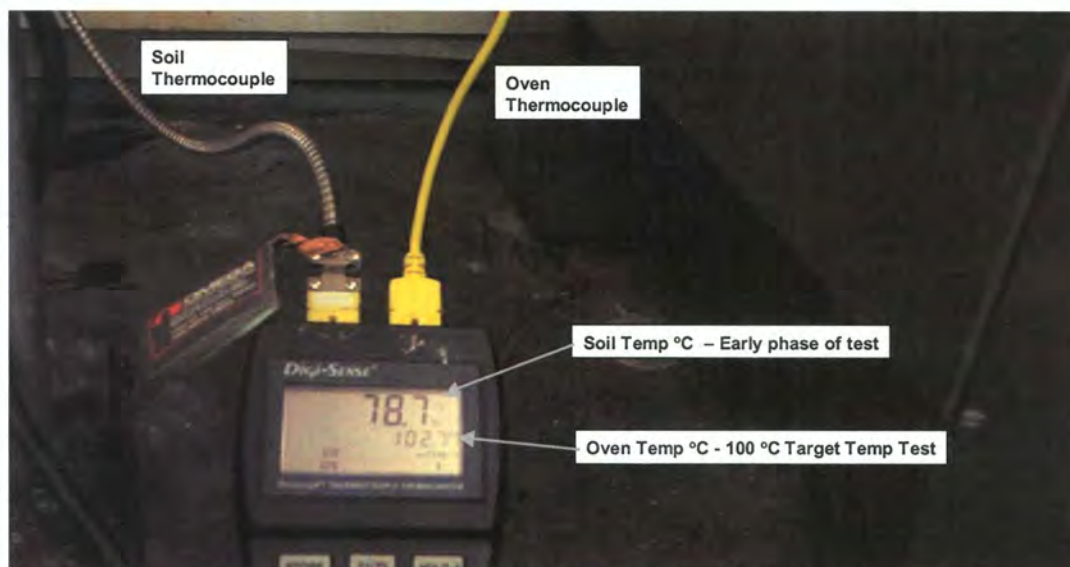


Figure 5. Data Logger Setup used for Continuous Measurement of Soil and Oven Temperatures.

After thermal testing was completed for each target temperature, a sample of the thermally-treated soil was collected for chemical analyses to allow comparison with pre-treatment concentrations (Table 4).

Table 4. Summary of Thermal Treatability Testing

Sample (Location)	Thermal Testing Conditions	Duration	Post-Treatment Analytical
Unsaturated PCB SO825 @ 1.5 ft (Former PCB Manufacturing Area)	300, 350, 425°C w/ dry air stream	72 hrs at each target temp.	PCBs EPA Method 680 VOCs – EPA Method 8260B SVOCs – EPA Method 8270C EOX – EPA Method 9023
Unsaturated MCB/DCB SCTB-67 @ DNAPL-K4 @ 9 ft (Former Chlorobenzene Process Area)	100, 132, 200°C w/ dry air stream	72 hrs at each target temp.	VOCs – EPA Method 8260B SVOCs – EPA Method 8270C EOX – EPA Method 9023
Saturated MCB/DCB DNAPL-K4 @ 16.5 ft (Former Chlorobenzene Process Area)	100, 132, 200°C w/ moist air stream	72 hrs at each target temp.	



5.0 STUDY RESULTS AND CONCLUSIONS

Table 5 and Figure 6 present the pre-treatment (starting) and post-treatment (ending) PCB concentrations for the sample from the Former PCB Manufacturing Area following heating to the three target temperatures of 300, 350 and 425°C. As can be seen from these data, thermal treatment was effective at removing PCBs from the soil. At a treatment temperature of 300°C, all of the di-, tri-, and tetrachlorobiphenyls were removed and concentrations of the higher substituted/molecular weight biphenyls were reduced to concentrations in the 100 to 1,000 µg/kg range. Overall, PCB concentrations were reduced from 2,447,000 µg/kg to 4,571 µg/kg with a treatment temperature of 300°C, a removal efficiency of 99.8 percent,

PCB Homologue	Summary of Total PCBs Analyses - USEPA Method 680 Results (µg/kg)						
	SHU-Unsaturated PCB - SO825 @ 1.5 Ft.						
	Pre-Treatment Concentrations	Results of Thermal Treatment Tests 72 Hours Retention at Each Treatment Temperature					
		Treatment Temperature 300°C		Treatment Temperature 350°C		Treatment Temperature 425°C	
		Average of Duplicates	% Reduction	Average of Duplicates	% Reduction	Result	% Reduction
Monochlorobiphenyl	<2,300	<67	NA	<67	NA	<3.4	NA
Dichlorobiphenyl	27,000	<67	99.86%	<67	99.86%	<3.4	99.994%
Trichlorobiphenyl	54,000	<67	99.93%	<67	99.93%	<3.4	99.997%
Tetrachlorobiphenyl	330,000	<140	99.98%	<140	99.98%	<6.8	99.999%
Pentachlorobiphenyl	480,000	245	99.95%	<140	99.99%	<6.8	99.999%
Hexachlorobiphenyl	700,000	985	99.86%	<140	99.99%	8	99.999%
Heptachlorobiphenyl	550,000	1550	99.72%	<200	99.98%	<10	99.999%
Octachlorobiphenyl	230,000	1030	99.55%	<200	99.96%	<10	99.998%
Nonachlorobiphenyl	57,000	270	99.53%	<340	99.70%	<17	99.985%
Decachlorobiphenyl	19,000 J	<640	98.32%	<640	98.32%	<17	99.955%
Total (using 1/2 RL)	2,447,000	4,571	99.81%	1,001	99.96%	47	99.998%

< = Analyte was not detected at or above the reporting limit

J = LCS, LCSD, MS, MSD, MD, or Surrogate exceeds the control limits

Table 5. Summary of Pre-and Post-Treatment PCB Concentrations.

Treatment at 350°C produced greater than 99.9 percent removal of the PCBs (all biphenyls were below the reporting limits). The slightly higher temperature resulted in faster removal rates (desorption and volatilization) for the heavier molecular weight biphenyls and complete removal within the 72-hour treatment time. It is reasonable to expect that most if not all of the biphenyls would have been removed at 300°C if a longer treatment time had been used (e.g., 144 hrs or 6 days). Treatment at 425°C produced similar results (greater than 99.9 percent removal) as treatment at 350°C although a residual concentration of 8 µg/kg of hexachlorobiphenyl remained after treatment.

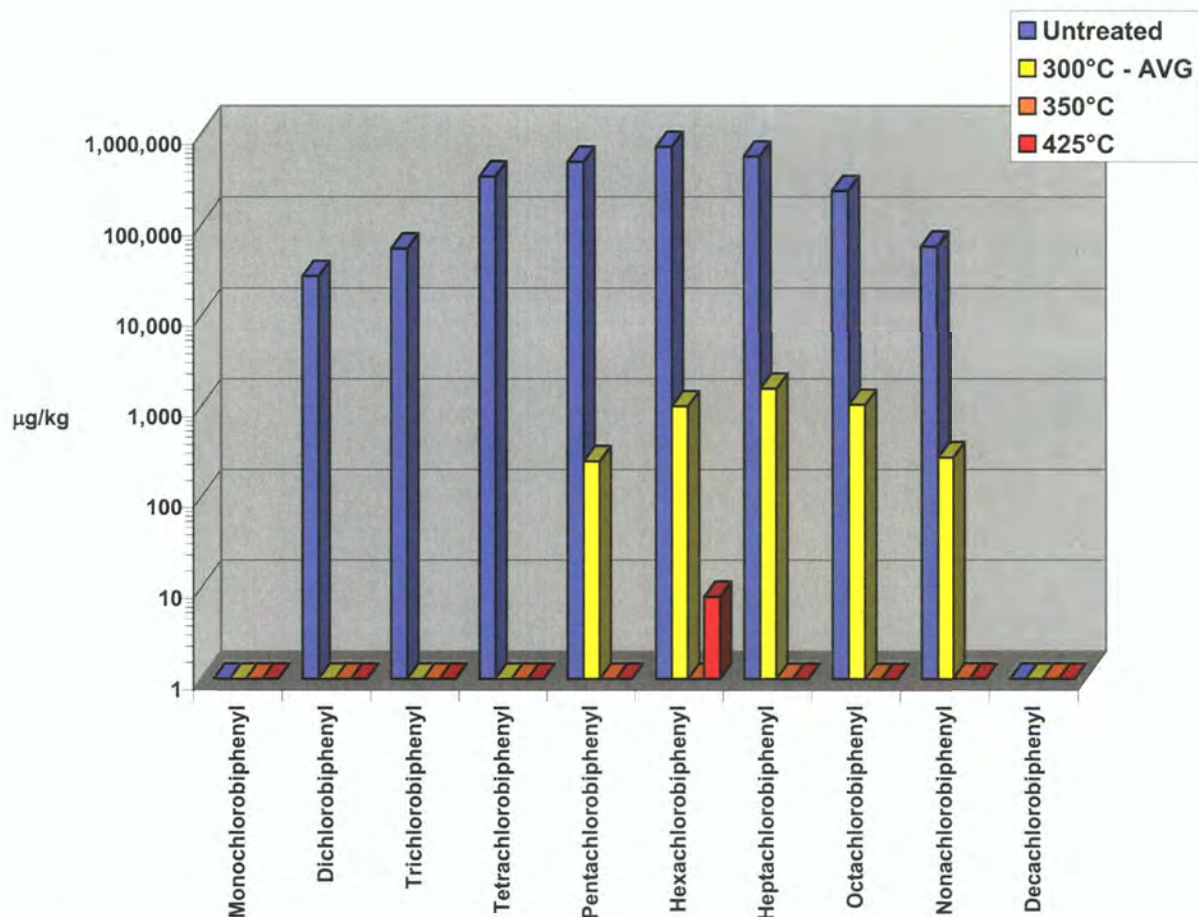


Figure 6. Comparison of Pre- and Post-Treatment PCB Concentrations.

Table 6 and Figure 7 present the pre-treatment (starting) and post-treatment (ending) concentrations of the unsaturated soil sample from the Former Chlorobenzene Process Area following heating to the three target temperatures (100, 132 and 200°C). As can be seen from these data, thermal treatment was effective at removing MCB and DCB from the soils. Removal efficiency improved slightly as a function of increasing treatment temperature with 99.8 percent removal at 100°C, 99.9 percent removal at 132°C and greater than 99.9 percent removal at 200°C. Residual MCB/DCB concentrations were 32,410, 16,300 and 1,351 µg/kg, respectively, in samples treated at 100, 132 and 200°C.



Table 6. MCB/DCB Thermal Treatability Results for Unsaturated Sample.

SHU Unsaturated MCB/DCB SCTB-67 @ DNAPL -K-4 @ 9' Results (µg/kg)							
COC	Avg. Pre-Treatment Spiked Conc.	Thermal Treatment @ 100°C 72 Hour Retention		Thermal Treatment @ 132°C 72 Hour Retention		Thermal Treatment @ 200°C 72 Hour Retention	
		VOC Analysis	% Removal	VOC Analysis	% Removal	VOC Analysis	% Removal
Chlorobenzene (MCB)	14,000,000	510	99.996%	<240	99.999%	110	99.999%
1,2-Dichlorobenzene	6,000,000	17,000	99.717%	9,100	99.848%	880	99.985%
1,3-Dichlorobenzene	3,000,000	3,900	99.870%	1,500	99.950%	71	99.998%
1,4-Dichlorobenzene	5,000,000	11,000	99.780%	5,700	99.886%	290	99.994%
Total Dichlorobenzenes (DCB)	14,000,000	31,900	99.772%	16,300	99.884%	1,241	99.991%
Total MCB+DCB	28,000,000	32,410	99.884%	16,420	99.941%	1,351	99.995%

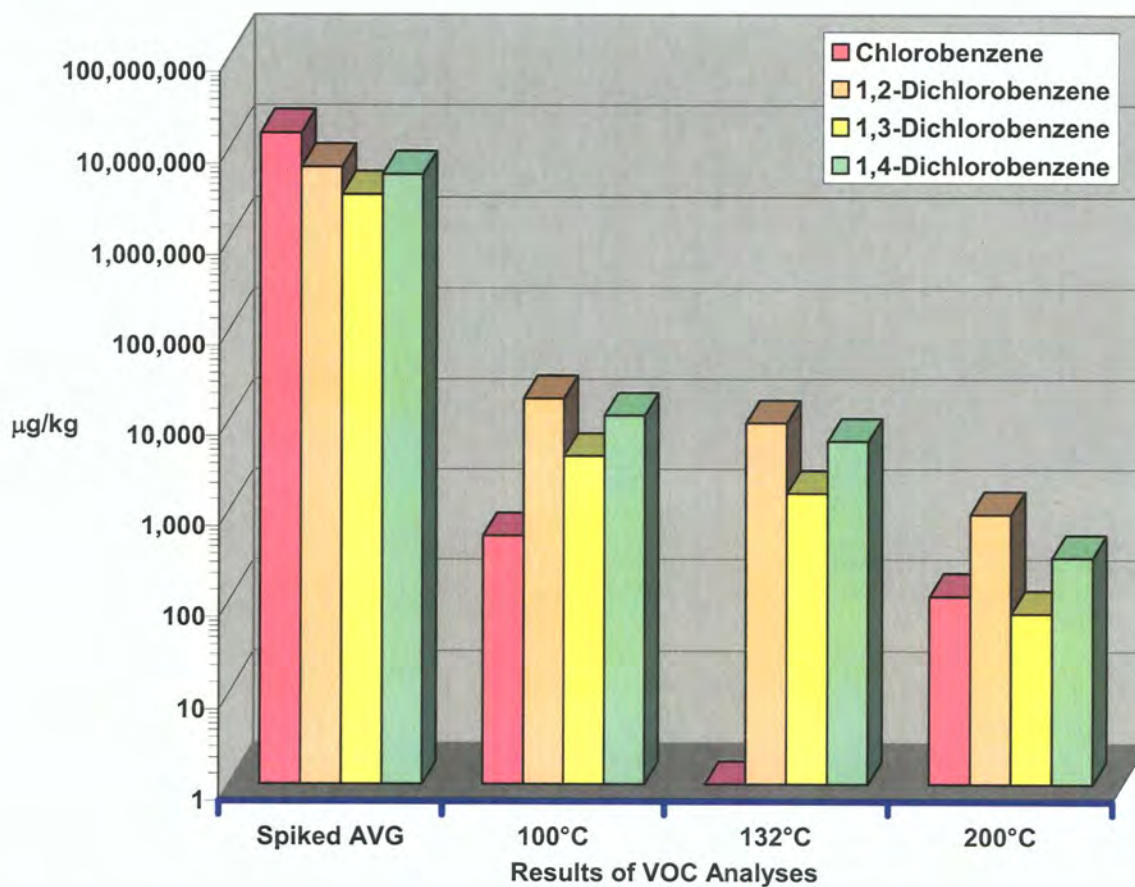


Figure 7. Summary of MCB/DCB Thermal Treatability Results for Unsaturated Sample.



Thermal treatment of the saturated soil sample from the Former Chlorobenzene Process Area at temperatures of 100, 132 and 200°C resulted in concentration reductions of greater than 99.9 percent at all three treatment temperatures and residual MCB/DCB concentrations of 62, 81.6 and 79.0 µg/kg, respectively, in the treated soil samples (Table 7 and Figure 8). Based on these data, there was no further enhancement in removal at treatment temperatures higher than 100°C.

Table 7. MCB/DCB Thermal Treatability Results for Saturated Sample.

SHU Saturated MCB/DCB SCTB-67 @ DNAPL -K-4 @ 16.5' Results (µg/kg)							
COC	Avg. Pre-Treatment Spiked Conc.	Thermal Treatment @ 100°C 72 Hour Retention		Thermal Treatment @ 132°C 72 Hour Retention		Thermal Treatment @ 200°C 72 Hour Retention	
		VOC Analysis	% Removal	VOC Analysis	% Removal	VOC Analysis	% Removal
Chlorobenzene (MCB)	560,000	62	99.9889%	66	99.979%	59	99.989%
1,2-Dichlorobenzene	1,100,000	<5.2	99.9998%	9	99.999%	14	99.999%
1,3-Dichlorobenzene	180,000	<5.2	99.9986%	<4.7	99.999%	<5	99.999%
1,4-Dichlorobenzene	600,000	<5.2	99.9996%	7	99.999%	6	99.999%
Total Dichlorobenzenes (DCB)	1,880,000	<5.2	99.9999%	18	99.999%	23	99.999%
Total MCB+DCB	2,440,000	65	99.9974%	84	99.997%	82	99.997%

The primary reason for the lower post treatment concentration levels in the saturated sample heated to 100°C as compared with the results of the unsaturated sample heated to the same temperature, is the higher COC starting concentrations present in the unsaturated sample. If the removal rates were the same for both the unsaturated and saturated samples, then 72 hours may not have been long enough to reduce COC concentrations to lower levels in the unsaturated sample. Given additional treatment time, the COC concentrations in the unsaturated sample would have likely been reduced further due to additional desorption and volatilization, as has been observed for other COCs (Uzgiris et al. 1995).

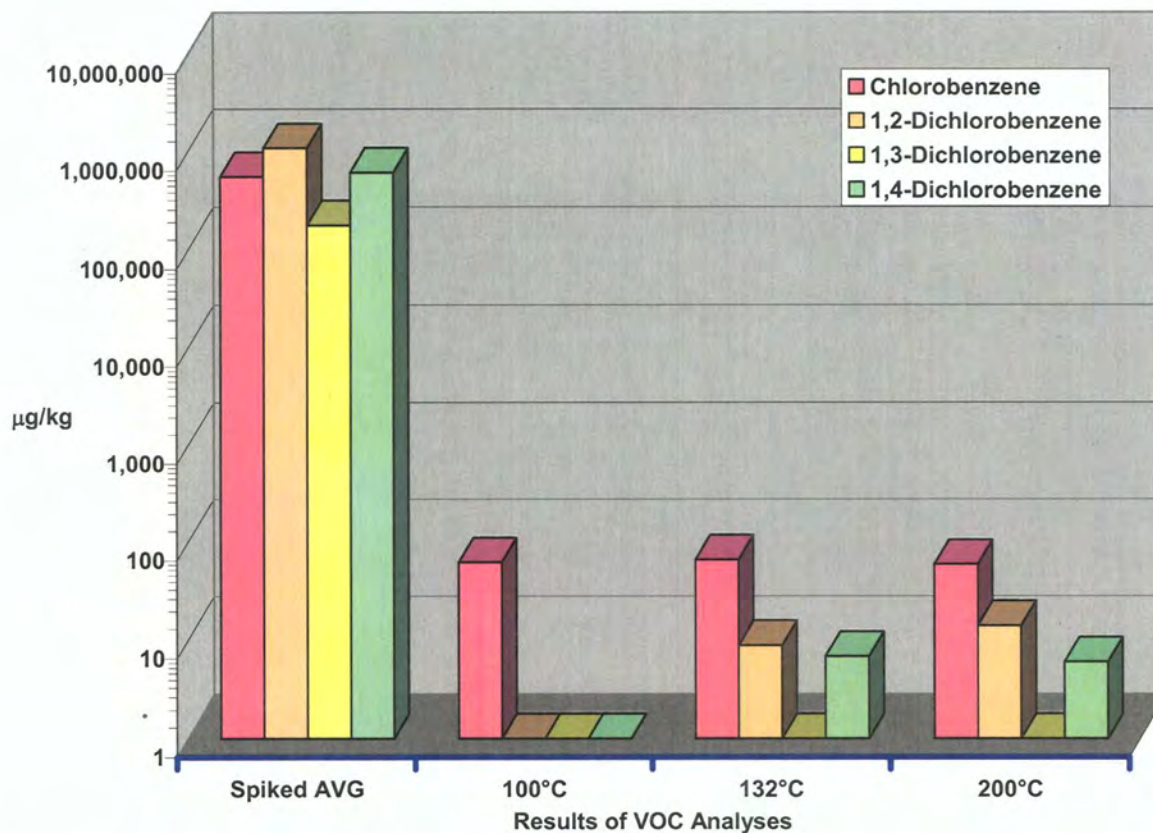


Figure 8. Summary of MCB/DCB Thermal Treatability Results for Saturated Sample

In conclusion, the results of the thermal treatability study indicate the following:

- A treatment temperature of 300°C or higher will result in reducing PCB concentrations in shallow, unsaturated soil samples from the Former PCB Manufacturing Area.
- A target treatment temperature of 100°C will result in reducing MCB/DCB concentrations in both unsaturated and saturated soil samples from the Former Chlorobenzene Process Area.



6.0 REFERENCES

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

April 18, 2006

REPLY TO THE ATTENTION OF

DE-9J

Via First-Class U.S. Mail

Mr. Craig Branchfield
Manager, Remedial Projects
Solutia Inc.
P.O. Box 66760
St. Louis, Missouri 63166-6760

RE: Sediment Sample Results
Solutia Inc.
ILD 000 802 702

Dear Mr. Branchfield:

Enclosed is EPA's report presenting the results of sediment samples obtained from the Mississippi River in October 2005.

If you have any questions, we can discuss the report further at our meeting scheduled for April 27, 2006.

Sincerely yours,

A handwritten signature in cursive script that reads "Kenneth S. Bardo".

Kenneth S. Bardo, Project Manager
Corrective Action Section

Enclosure



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

April 18, 2006

REPLY TO THE ATTENTION OF

DE-9J

Via First-Class U.S. Mail

Ms. Dawn Lamm
U.S. Army Corps of Engineers
Hydraulics Branch, EC-HPR
1222 Spruce Street
St. Louis, Missouri 63103

RE: Sediment Sample Results
Solutia Inc.
ILD 000 802 702

Dear Ms. Lamm:

Enclosed is EPA's report presenting the results of sediment samples obtained from the Mississippi River at the Chain-of Rocks area to the Jefferson Barracks Chute in October 2005. Data at Jefferson Barracks shows the presence of PCBs and pesticides that exceed EPA Region 5 ecological screening levels. EPA is further evaluating these results.

If you have any questions regarding the report, please contact me at (312) 886-7566 or at bardo.kenneth@epa.gov.

Sincerely yours,

Kenneth S. Bardo

Kenneth S. Bardo, Project Manager
Corrective Action Section

Enclosure



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5

77 WEST JACKSON BOULEVARD

CHICAGO, IL 60604-3590

April 18, 2006

REPLY TO THE ATTENTION OF

DE-9J

Via First-Class U.S. Mail

Mr. Mike Sullivan
Township of Prairie duPont
Levee & Sanitary District
1327 Davis Street Ferry Road
East Carondelet, IL 62240

RE: Sediment Sample Results
Solutia Inc.
ILD 000 802 702

Dear Mr. Sullivan:

Enclosed is EPA's report presenting the results of sediment samples obtained from the Mississippi River in October 2005. Sediment near or along the east bank was sampled at twenty-two (22) locations from Arsenal Island to the Jefferson Barracks Chute south of the JB Bridge. Soil above the east bank was sampled at three (3) locations.

Most sample locations were clean with no detections of contaminants. PCBs and pesticides were found in sediment at two (2) locations (RM 170 and RM 167.5) that exceed EPA Region 5 ecological screening levels. We are further evaluating these results.

If you have any questions regarding the report, I am available at (312) 886-7566 or at bardo.kenneth@epa.gov.

Sincerely yours,

A handwritten signature in cursive script that reads "Kenneth S. Bardo".

Kenneth S. Bardo, Project Manager
Corrective Action Section

Enclosure



April 17, 2006

Mississippi River Sediment Study
(River Mile 189.5 to 166)
Solutia WG Krummrich Facility

Sediment Sampling Program

From October 12 through October 19, 2005, EPA contractors collected sediment samples from the Mississippi River for analysis of VOCs, SVOCs, PCBs, pesticides, herbicides, TOC, and grain-size. All analyses were performed at the EPA Central Regional Laboratory in Chicago, IL except for herbicides which were analyzed at Severn Trent Laboratories in Pittsburgh, PA.

Sediment from twenty (20) sample locations was collected using a Vibracore sampling tool and sediment/soil from eight (8) sample locations was collected using a Geoprobe sampling tool.

Sample Locations and Collection

Sample locations are provided in Table 1 and Appendix A. Borehole logs identifying the type of sediment encountered are presented in Appendix B. Field screening results (PID readings) and sample collection intervals for each core are provided in Tables 2 and 3.

Upstream (reference) sediment samples were obtained at the Chain-of-Rocks area (RM 189.5 to 185.5). Downstream river sediment samples were collected from sediment depositional areas along the east bank of the Mississippi River at Arsenal Island (RM 176 to 173), Jefferson Barracks (RM 171 to 168), and Carroll Island/Jefferson Barracks Chute (RM 168 to 166). The US Army Corps of Engineers (ACE) has constructed numerous dikes in these areas to help maintain the navigational channel. ACE also dredges the navigational channel along the west bank and deposits the dredged sediment toward the east bank where sand bars are present. The sand bars are exposed during low-flow periods.

Three (3) soil samples were collected above the east bank of the river. They are sample locations S-29, S-30, and S-31. Public access is possible at these locations by the local community.

Results

Analytical results are provided in Table 4. Detected compounds are summarized and compared to applicable screening levels in Table 5.

The detected compounds include several VOCs (methylene chloride, chloroethane, 1,4-dichlorobenzene, toluene, and 1,2,3-trichloropropane), an SVOC (benzo(a)pyrene), PCBs (PCB-1016 and PCB-1260), and pesticides (heptachlor epoxide, 4,4'-DDD, and 4,4'-DDT).

Comparison to Screening Levels

The most notable results were found at sediment sample locations S-24 (Jefferson Barracks Chute, RM 167.5) and S-26/S-27 (Jefferson Barracks, RM 170). PCBs, heptachlor epoxide, 4,4'-DDD, and 4,4'-DDT were found in concentrations that exceed EPA Region 5 Ecological Screening Levels (ESLs). ESLs are protective benchmarks based on water quality criteria, sediment quality guidelines, and chronic no adverse effect levels.

Comparison to Historical Data

Historical sediment sampling related to the Solutia WG Krummrich facility and Site R (RM 178) was performed by Solutia and EPA in October 2000, and by Solutia in November 2002 and September 2005. Solutia also analyzed whole body fish tissue in October 2000. Historical data shows that PCBs, heptachlor epoxide, 4,4'-DDD, and 4,4'-DDT were also detected at sample locations in the vicinity of Site R (RM 178 to RM 177).

In October 2000, sediment and whole body fish tissue was sampled upstream, downstream, and in the vicinity of Site R. EPA found PCBs at four sediment sample locations and 4,4'-DDD at one sediment sample location in the vicinity of Site R. PCB concentrations ranged from 20 to 120 µg/kg, and 4,4'-DDD was at a concentration of 14 µg/kg. ESLs were exceeded for PCBs and 4,4'-DDD at one sample location, and for PCBs at another sample location. Solutia found 1.6 µg/kg of 4,4'-DDD at one sediment sample location. Solutia also found heptachlor epoxide and 4,4'-DDD in whole body tissue from fish collected in the vicinity of Site R and downstream.

In November 2002, Solutia sampled sediment upstream, downstream, and in the vicinity of Site R. At the southern boundary and just downstream of Site R, Solutia detected PCBs at four sample locations, heptachlor epoxide at three sample locations, and 4,4'-DDD or 4,4'-DDT at two sample locations. Total PCB concentrations ranged from 2.4 to 69.4 µg/kg, heptachlor epoxide concentrations ranged from 0.31 to 11 µg/kg, 4,4'-DDD was at 1.2 µg/kg, and 4,4'-DDT was at 3.3 µg/kg. ESLs were exceeded at one of the sample locations for PCBs and heptachlor epoxide.

Further downstream in November 2002, Solutia detected PCBs, 4,4'-DDD, and/or 4,4'-DDT at three sediment sample locations. Approximately 2250' south of Site R, PCBs were found at a concentration of 8.9 µg/kg at one location. At a nearby location, 4,4'-DDD was found at 0.96 µg/kg and 4,4'-DDT at 3 µg/kg. 4,4'-DDT was found at 0.5 µg/kg at a sample location approximately 4500' south of Site R. No ESLs were exceeded at any of these sample locations.

In September 2005, Solutia resampled the sediment in the vicinity of Site R after the interim groundwater remedy was completed. The interim remedy collects and treats contaminated groundwater before it discharges to the Mississippi River. PCBs were not analyzed for during this sampling event. Solutia found 4,4'-DDD at two sample locations at concentrations of 1.15 µg/kg and 6.5 µg/kg. The ESL for 4,4'-DDD was exceeded at one of the sample locations.

Observations

In October 2005, concentrations of PCBs, heptachlor epoxide, 4,4'-DDD, and 4,4'-DDT exceeding ESLs were found at sediment sample locations S-24 (Jefferson Barracks Chute, RM 167.5) and S-26/S-27 (Jefferson Barracks, RM 170) located downstream of Site R. Further investigations of these areas may be necessary to determine potential ecological impacts. Table 6 provides a summary of all relevant sediment data obtained from October 2000 to October 2005. The data is summarized by river mile (RM) and extends from Site R (RM 178) to Jefferson Barracks Chute (RM 167.5).

TABLE 1: GPS Coordinates for Sample Locations

Sample ID	GPS Coordinate	Sampling Tool; Special Note	Sample Type
S-1	38° 42.284' 90° 12.437'	Vibracore	Sediment
S-2	38° 42.154' 90° 12.363'	Vibracore	Sediment
S-3	38° 34.128' 90° 13.518'	Vibracore	Sediment
S-4	38° 34.065' 90° 13.557'	Vibracore	Sediment
S-5	38° 33.910' 90° 13.665'	Vibracore	Sediment
S-6	38° 34.065' 90° 13.557'	Vibracore; Duplicate of S-4	Sediment
S-7	38° 33.715' 90° 13.975'	Vibracore	Sediment
S-8	38° 33.517' 90° 14.146'	Vibracore	Sediment
S-9	38° 33.388' 90° 14.252'	Vibracore	Sediment
S-10	38° 33.261' 90° 14.354'	Vibracore	Sediment
S-11	38° 33.044' 90° 14.467'	Vibracore	Sediment
S-12	38° 32.971' 90° 14.465'	Vibracore	Sediment
S-13	38° 27.009' 90° 16.808'	Vibracore	Sediment
S-14	38° 27.079' 90° 16.801'	Vibracore	Sediment
S-15	38° 27.809' 90° 16.725'	Vibracore	Sediment
S-16	38° 28.287' 90° 16.505'	Vibracore	Sediment
S-17	38° 29.794' 90° 16.057'	Vibracore	Sediment
S-18	38° 31.081' 90° 15.606'	Vibracore	Sediment
S-19	38° 31.081' 90° 15.606'	Vibracore; Duplicate of S-18	Sediment
S-20	38° 31.347' 90° 15.517'	Vibracore	Sediment
S-21	38° 31.645' 90° 15.400'	Vibracore	Sediment
S-22	38° 44.751' 90° 10.776'	Vibracore	Sediment
S-23	38° 27.990' 90° 16.492'	Geoprobe	Sediment
S-24	38° 27.882' 90° 16.463'	Geoprobe	Sediment
S-25	38° 30.597' 90° 15.764'	Geoprobe	Sediment
S-26	38° 30.354' 90° 15.861'	Geoprobe	Sediment
S-27	38° 30.354' 90° 15.861'	Geoprobe; Duplicate of S-26	Sediment
S-28	38° 33.048' 90° 14.295'	Geoprobe	Sediment
S-29	38° 33.214' 90° 14.085'	Geoprobe	Soil
S-30	38° 34.290' 90° 13.214'	Geoprobe	Soil
S-31	38° 29.075' 90° 16.110'	Geoprobe	Soil

TABLE 2: PID Readings

Sample No. / Hydrographic Map No.	Range of PID Readings (ppm)	Location on Core of Peak Reading
S-01/ 3	0- 13.5	19 inches below top of core
S-02/ 4	0- 0.4	2 feet below top of core
S-03 / 7	0	NA
S-04 & S-06/ 8	0.5-1	3.5-4 feet below top of core
S-05/ 9	0	NA
S-07/ 10	0	NA
S-08/ 11	0	NA
S-09/ 13	0	NA
S-10/ 14	0	NA
S-11/ 16	0	NA
S-12/ 17	0	NA
S-13/ South of 40	0	NA
S-14/ 40	0	NA
S-15/ West of 35	0	NA
S-16/ 32	0	NA
S-17/ South of 26	26.5 – 185	60 inches below top of core
S-18 & S-19/ Between 21 & 22	1.6 – 359	5-6 feet below top of core
S-20/ 18	0-14.1	0-1 feet below top of core
S-21/ North of 18	15.3- 177	2-3 feet below top of core
S-22/ North of 2	10.1 – 229	1-2 feet below top of core
S-23/ 33	NT	NT
S-24/ 34	NT	NT
S-25/ 22	NT	NT
S-26 & S-27/ 24	NT	NT
S-28/ South of 17	NT	NT
S-29/ East of 15	NT	NT
S-30/ East of 6	NT	NT
S-31/ East of 29	NT	NT

NT No reading taken due to fluctuations from the PID

NA Not available

ppm Parts Per Million

TABLE 3: Sample Collection Intervals

Sample No. / Hydrographic Map No.	Sample Collection Interval
S-01/ 3	1.5 - 2.5 feet below top of core
S-02/ 4	1.5 - 2.5 feet below top of core
S-03 / 7	1.5 - 3 feet below top of core
S-04 & S-06/ 8	2 - 3.5 feet below top of core
S-05/ 9	0.5 - 2.5 feet below top of core
S-07/ 10	Entire core
S-08/ 11	8 - 22 inches below top of core
S-09/ 13	1- 18 inches below top of core
S-10/ 14	6 - 20 inches below top of core
S-11/ 16	0 - 15 inches below top of core
S-12/ 17	Entire core
S-13/ South of 40	3 - 5 feet below top of core
S-14/ 40	Top 8 inches of core
S-15/ West of 35	Top 6 inches of core
S-16/ 32	3 - 4 feet below top of core
S-17/ South of 26	3.75 - 5 feet below top of core
S-18 & S-19/ Between 21 & 22	5 - 6 feet below top of core
S-20/ 18	Top foot of core
S-21/ North of 18	2 - 3 feet below top of core
S-22/ North of 2	1.25 - 2.25 feet below top of core
S-23/ 33	15.5 - 19.5 feet below top of core
S-24/ 34	5.5 - 6.5 feet below top of core
S-25/ 22	Top 2 feet of core
S-26 & S-27/ 24	0.5 - 3.5 feet below top of core
S-28/ South of 17	5 - 7.5 feet below top of core
S-29/ East of 15	1 - 2 and 3 - 3.5 feet below top of core
S-30/ East of 6	5.5 - 7 feet below top of core
S-31/ East of 29	2.5 - 4 feet below top of core

TABLE 4: Analytical Results
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-01	S-02	S-03	S-04	S-05	S-06	S-07	S-08
Chlorinated Herbicides by SW 846 Method 8151A (µg/kg)								
2,4 - D	<120	<130	<110	<130 UJ	<130	<89	<91	<91
Dalapon	<60	<67	<53	<67	<67	<44	<46	<46
2,4 - DB	<120	<130	<110	<130	<130	<89	<91	<91
Dicamba	<60	<67	<53	<67	<67	<44	<46	<46
Dichloroprop	<120	<130	<110	<130	<130	<89	<91	<91
Dinoseb	<18	<20	<16	<20	<20	<13	<14	<14
MCPA	<12000	<13000	<11000	<13000	<13000	<8900	<9100	<9100
MCPP	<12000	<13000	<11000	<13000	<13000	<8900	<9100	<9100
Pentachlorophenol	<15	<17	<13	<17	<17	<11	<11	<11
2,4,5 - TP (Silvex)	<30	<33	<27	<33	<33	<22	<23	<23
2,4,5 - T	<30	<33	<27	<33	<33	<22	<23	<23
Pesticides by CRL SOP GC001 (mg/kg)								
Alpha-BHC	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Gamma-BHC	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Beta-BHC	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Heptachlor	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Delta-BHC	<0.00266	<0.00288	<0.00246	<0.00330 UJ	<0.00295	<0.00342	<0.00227	<0.00214
Aldrin	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Heptachlor epoxide	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Gamma-Chlordane	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Alpha-Chlordane	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Endosulfan I	<0.00266	<0.00288	<0.00246	<0.00330 UJ	<0.00295	<0.00342	<0.00227	<0.00214
4,4-DDE	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Dieldrin	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Endrin	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
4,4'-DDD	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Endosulfan II	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
4,4-DDT	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Endrin aldehyde	<0.00266	<0.00288	<0.00246	<0.00330 UJ	<0.00295	<0.00342	<0.00227	<0.00214
Endosulfan Sulfate	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Methoxychlor	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
Endrin Ketone	<0.00266	<0.00288	<0.00246	<0.00330	<0.00295	<0.00342	<0.00227	<0.00214
PCBs by EPA CRL SOP GC002 (mg/kg)								
PCB-1016	<0.0518	<0.0561	<0.0479	<0.0644	<0.0575	<0.0668	<0.0442	<0.0417
PCB-1221	<0.0266	<0.0288	<0.0246	<0.0330	<0.0295	<0.0342	<0.0277	<0.0214
PCB-1232	<0.0266	<0.0288	<0.0246	<0.0330	<0.0295	<0.0342	<0.0277	<0.0214
PCB-1242	<0.0266	<0.0288	<0.0246	<0.0330	<0.0295	<0.0342	<0.0277	<0.0214
PCB-1248	<0.0266	<0.0288	<0.0246	<0.0330	<0.0295	<0.0342	<0.0277	<0.0214
PCB-1254	<0.0266	<0.0288	<0.0246	<0.0330	<0.0295	<0.0342	<0.0277	<0.0214
PCB-1260	<0.0266	<0.0288	<0.0246	<0.0330	<0.0295	<0.0342	<0.0277	<0.0214
PCB-1262	<0.0266	<0.0288	<0.0246	<0.0330	<0.0295	<0.0342	<0.0277	<0.0214
PCB-1268	<0.0266	<0.0288	<0.0246	<0.0330	<0.0295	<0.0342	<0.0277	<0.0214
Toxaphene	<0.0266	<0.0288	<0.0246	<0.0330	<0.0295	<0.0342	<0.0277	<0.0214
Chlordane(tech)	<0.0730	<0.0792	<0.0675	<0.0909 UJ	<0.0810	<0.0941	<0.0624	<0.0588
Total Organic Carbon by EPA CRL SOP AIG009 (%)								
%	0.5	0.3	1.6	1.3 J	1.2	1.6	0.2	<0.1
Percent Solid by EPA CRL GCMS026 (%)								
%	74.8	62.6	72.7	59.8	63.5	55.8	86.9	88.8

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-01	S-02	S-03	S-04	S-05	S-06	S-07	S-08
Grain Size by ASTM Guidelines and EPA CRL AIG038 (%)								
Gravel	0.0	0.03	0.0	0.01	0.0	0.01	0.39	6.89
Coarse Sand	0.1	0.2	0.4	0.32	0.1	0.00	3.88	4.86
Medium Sand	1.7	0.09	7.7	0.31	1.17	0.3	24.65	41.99
Fine Sand	43.6	1.48	65.3	10.52	12.27	16.45	70.94	46.16
Silt and Clay	54.6	98.2	26.6	88.85	85.4	83.54	0.14	0.1
SVOCs by EPA CRL SOP GCMS026 (µg/Kg)								
1,2,4-Trichlorobenzene	<670	<790	<632	<753	<781	<920	<546	<561
1,2-Dichlorobenzene	<670	<790	<632	<753	<781	<920	<546	<561
1,3-Dichlorobenzene	<670	<790	<632	<753	<781	<920	<546	<561
1,4-Dichlorobenzene	<670	<790	<632	<753	<781	<920	<546	<561
2,4,6-Trichlorophenol	<670	<790	<632	<753	<781	<920	<546	<561
2,4,5-Trichlorophenol	<670	<790	<632	<753	<781	<920	<546	<561
2,4-Dichlorophenol	<670	<790	<632	<753	<781	<920	<546	<561
2,4-Dimethylphenol	<670	<790	<632	<753	<781	<920	<546	<561
2,4-Dinitrophenol	<670	<790	<632	<753 UJ	<781	<920	<546	<561
2,4-Dinitrotoluene	<670	<790	<632	<753	<781	<920	<546	<561
2,6-Dinitrotoluene	<670	<790	<632	<753	<781	<920	<546	<561
2-Chloronaphthalene	<670	<790	<632	<753	<781	<920	<546	<561
2-Chlorophenol	<670	<790	<632	<753	<781	<920	<546	<561
2-Methylnaphthalene	<670	<790	<632	<753	<781	<920	<546	<561
2-Nitroaniline	<670	<790	<632	<753	<781	<920	<546	<561
2-Nitrophenol	<670	<790	<632	<753	<781	<920	<546	<561
3,3-Dichlorobenzidine	<670	<790	<632	<753 J	<781	<920	<546	<561
3-Nitroaniline	<670	<790	<632	<753 UJ	<781	<920	<546	<561
4,6-Dinitro-2-methylphenol	<670	<790	<632	<753 J	<781	<920	<546	<561
4-Bromophenylphenyl ether	<670	<790	<632	<753	<781	<920	<546	<561
4-Chloroaniline	<670	<790	<632	<753	<781	<920	<546	<561
4-Chloro-3-methylphenol	<670	<790	<632	<753	<781	<920	<546	<561
4-Chlorophenyl phenyl ether	<670	<790	<632	<753	<781	<920	<546	<561
4-Nitrophenol	<670	<790	<632	<753 UJ	<781	<920	<546	<561
Acenaphthene	<670	<790	<632	<753	<781	<920	<546	<561
Acenaphthylene	<670	<790	<632	<753	<781	<920	<546	<561
Anthracene	<670	<790	<632	<753	<781	<920	<546	<561
Benzo(a)anthracene	<670	<790	<632	<753	<781	<920	<546	<561
Benzo(a)pyrene	705	<790	<632	<753	<781	<920	<546	<561
Benzo(b)fluoranthene	<670	<790	<632	<753	<781	<920	<546	<561
Benzo(g,h,i)perylene	<670	<790	<632	<753	<781	<920	<546	<561
Benzo(k)fluoranthene	<670	<790	<632	<753 L	<781	<920	<546	<561
Benzyl alcohol	<670	<790	<632	<753	<781	<920	<546	<561
Bis(2-chloroethoxy) methane	<670	<790	<632	<753	<781	<920	<546	<561
Bis(2-chloroethyl)ether	<670	<790	<632	<753	<781	<920	<546	<561
Bis(2-ethylhexyl) phthalate	<670	<790	<632	<753 L	<781	<920	<546	<561
Bis(2-chloroisopropyl)ether	<670	<790	<632	<753	<781	<920	<546	<561
Butyl benzyl phthalate	<670	<790	<632	<753	<781	<920	<546	<561
Carbazole	<670	<790	<632	<753 J	<781	<920	<546	<561

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-01	S-02	S-03	S-04	S-05	S-06	S-07	S-08
Chrysene	<670	<790	<632	<753	<781	<920	<546	<561
Dibenzo(a,h)anthracene	<670	<790	<632	<753	<781	<920	<546	<561
Dibenzofuran	<670	<790	<632	<753	<781	<920	<546	<561
Diethyl phthalate	<670	<790	<632	<753 L	<781	<920	<546	<561
Dimethyl phthalate	<670	<790	<632	<753	<781	<920	<546	<561
Di-n-butyl phthalate	<670	<790	<632	<753 L	<781	<920	<546	<561
Di-n-octylphthalate	<670	<790	<632	<753 L	<781	<920	<546	<561
Fluoranthene	<670	<790	<632	<753 L	<781	<920	<546	<561
Fluorene	<670	<790	<632	<753	<781	<920	<546	<561
Hexachlorobenzene	<670	<790	<632	<753	<781	<920	<546	<561
Hexachlorobutadiene	<670	<790	<632	<753	<781	<920	<546	<561
Hexachloro-cyclopentadiene	<670	<790	<632	<753 R	Rejected	<920	<546	<561
Hexachloroethane	<670	<790	<632	<753 J	<781	<920	<546	<561
Indeno(1,2,3-cd)pyrene	<670	<790	<632	<753	<781	<920	<546	<561
Isophorone	<670	<790	<632	<753	<781	<920	<546	<561
2-Methylphenol	<670	<790	<632	<753	<781	<920	<546	<561
3-Methylphenol	<1340	<1580	<1260	<1510	<1560	<1840	<1090	<1120
4-Methylphenol	<1340	<1580	<1260	<1510	<1560	<1840	<1090	<1120
Naphthalene	<812	<958	<767	<913	<947	<1110	<662	<680
Nitrobenzene	<670	<790	<632	<753	<781	<920	<546	<561
n-Nitroso-di-n-propylamine	<670	<790	<632	<753	<781	<920	<546	<561
n-Nitrosodiphenylamine	<670	<790	<632	<753	<781	<920	<546	<561
Pentachlorophenol	<670	<790	<632	<753 UJ	<781	<920	<546	<561
Phenanthrene	<670	<790	<632	<753 L	<781	<920	<546	<561
Phenol	<670	<790	<632	<753	<781	<920	<546	<561
Pyrene	<670	<790	<632	<753	<781	<920	<546	<561
VOCs by EPA CRL SOP GCMS001 (µg/kg)								
Acetone	71.5	125	69.1	85.2 L	189	68.7	<27.9	<28.8
Acrolein	<165	<204	<240	<210 R	<443	<256	<139	<144
Acrylonitrile	<32.9	<40.9	<48	<42.1 J	<88.7	<51.2	<27.9	<28.8
Benzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
bis(Chloromethyl)ether	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
Bromobenzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
Bromochloromethane	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
Bromodichloromethane	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
Bromoform	<6.58	<8.18	<9.61	<8.42 J	<17.7	<10.2	<11.2	<11.5
Bromomethane	<32.9	<40.9	<48	<42.1 UJ	<88.7	<51.2	<27.9	<28.8
2-Butanone (MEK)	<32.9	<40.9	<48	<42.1 J	<88.7	<51.2	<27.9	<28.8
n-Butylbenzene	<6.58	<8.18	<9.61	<8.42 R	<17.7	<10.2	<5.58	<5.75
sec-Butylbenzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
tert-Butylbenzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
Carbon disulfide	45.5	139	<48	53.6 L	<97.7	<51.2	<27.9	<28.8
Carbon tetrachloride	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
Chlorobenzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
Chloroethane	19.6	<8.18	29.1	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,2-Dichlorobenzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
Chloroform	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
Chloromethane	<13.2	<16.4	<19.2	<16.8 L	<35.5	<20.5	<11.2	<11.5
2-Chlorotoluene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
4-Chlorotoluene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-01	S-02	S-03	S-04	S-05	S-06	S-07	S-08
Dibromochloromethane	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,2-Dibromo-3-chloropropane	<6.58	<8.18	<9.61	<8.42 J	<17.7	<10.2	<5.58	<5.75
1,2-Dibromoethane (EDB)	<6.58	<8.18	<9.61	<8.42 J	<17.7	<10.2	<5.58	<5.75
Dibromomethane	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,3-Dichlorobenzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,4-Dichlorobenzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,1-Dichloroethane	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,2-Dichloroethane	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,1-Dichloroethene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
cis-1,2-Dichloroethene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
trans-1,2-Dichloroethene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,2-Dichloropropane	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,3-Dichloropropane	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
2,2-Dichloropropane	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,1-Dichloropropene	<6.58	<8.18	<9.61	<8.42 R	<17.7	<10.2	<5.58	<5.75
cis-1,3-Dichloropropene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
trans-1,3-Dichloropropene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,2-Dimethylbenzene (o-xylene)	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,3-Dimethylbenzene (m-xylene)	<13.2	<16.4	<19.2	<16.8 L	<35.5	<20.5	<11.2	<11.5
1,4-Dimethylbenzene (p-xylene)	<13.2	<16.4	<19.2	<16.8 L	<35.5	<20.5	<11.2	<11.5
Ethylbenzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
Hexachlorobutadiene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
2-Hexanone	<13.2	<16.4	<19.2	<16.8 K	<35.5	<20.5	<11.2	<11.5
Isopropylbenzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
p-Isopropyltoluene	<6.58	<8.18	<9.61	<8.42 R	<17.7	<10.2	<5.58	<5.75
Methylene chloride	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
4-Methyl-2-pentanone	<13.2	<16.4	<19.2	<16.8 J	<35.5	<20.5	<11.2	<11.5
n-Propylbenzene	<6.58	<8.18	<9.61	<8.42 R	<17.7	<10.2	<5.58	<5.75
Styrene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,1,1,2-Tetrachloroethane	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,1,2,2-Tetrachloroethane	<6.58	<8.18	<9.61	<8.42 J	<17.7	<10.2	<5.58	<5.75
Tetrachloroethene	<6.58	<8.18	<9.61	<8.42 R	<17.7	<10.2	<5.58	<5.75
Toluene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,2,3-Trichlorobenzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,2,4-Trichlorobenzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,1,1-Trichloroethane	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,1,2-Trichloroethane	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
Trichloroethene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,2,3-Trichloropropane	<6.58	<8.18	<9.61	<8.42 J	<17.7	<10.2	<5.58	<5.75
1,2,4-Trimethylbenzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
1,3,5-Trimethylbenzene	<6.58	<8.18	<9.61	<8.42 L	<17.7	<10.2	<5.58	<5.75
Vinyl chloride	<13.2	<16.4	<19.2	<16.8 L	<35.5	<20.5	<11.2	<11.5

¹ Bold denotes detected parameters

R This qualifier denotes that the data is unusable for its intended purpose. (Note: analyte may or may not be present)

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

- J This qualifier denotes that the analyte or compound is present, but at an estimated concentration.
- L This qualifier denotes that the analyte or compound is present, but the reported concentration may be biased low.
- U This qualifier denotes that the analyte or compound was not detected at the indicated reporting limit.

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-09	S-10	S-11	S-12	S-13	S-14	S-15	S-16
Chlorinated Herbicides by SW 846 Method 8151A (µg/kg)								
2,4 - D	<92	<94	<91	<89	<140	<91	<100	<100
Dalapon	<46	<47	<45	<44	<68	<46	<50	<50
2,4 - DB	<92	<94	<91	<89	<140	<91	<100	<100
Dicamba	<46	<47	<45	<44	<68	<46	<50	<50
Dichloroprop	<96	<94	<91	<89	<140	<91	<100	<100
Dinoseb	<14	<14	<14	<13	<20	<14	<15	<15
MCPA	<9200	<9400	<9100	<8900	<14000	<9100	<10000	<10000
MCPP	<9200	<9400	<9100	<8900	<14000	<9100	<10000	<10000
Pentachlorophenol	<11	<12	<11	<11	<17	<11	<13	<13
2,4,5 - TP (Silvex)	<23	<23	<23	<22	<34	<23	<25	<25
2,4,5 - T	<23	<23	<27	<22	<34	<23	<25	<25
Pesticides by CRL SOP GC001 (mg/kg)								
Alpha-BHC	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Gamma-BHC	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Beta-BHC	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Heptachlor	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Delta-BHC	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Aldrin	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Heptachlor epoxide	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Gamma-Chloradane	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Alpha-Chloradane	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Endosulfan I	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
4,4-DDE	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Dieldrin	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Endrin	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
4,4'-DDD	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Endosulfan II	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
4,4'-DDT	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Endrin aldehyde	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Endosulfan Sulfate	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Methoxychlor	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
Endrin Ketone	<0.00218	<0.00227	<0.00216	<0.00214	<0.00319	<0.00212	<0.00256	<0.00265
PCBs by EPA CRL SOP (mg/Kg)								
PCB-1016	<0.0424	<0.0442	<0.0422	<0.0417	<0.0621	<0.0413	<0.0499	<0.0516
PCB-1221	<0.0218	<0.0227	<0.0216	<0.0214	<0.0319	<0.0212	<0.0256	<0.0265
PCB-1232	<0.0218	<0.0227	<0.0216	<0.0214	<0.0319	<0.0212	<0.0256	<0.0265
PCB-1242	<0.0218	<0.0227	<0.0216	<0.0214	<0.0319	<0.0212	<0.0256	<0.0265
PCB-1248	<0.0218	<0.0227	<0.0216	<0.0214	<0.0319	<0.0212	<0.0256	<0.0265
PCB-1254	<0.0218	<0.0227	<0.0216	<0.0214	<0.0319	<0.0212	<0.0256	<0.0265
PCB-1260	<0.0218	<0.0227	<0.0216	<0.0214	<0.0319	<0.0212	<0.0256	<0.0265
PCB-1262	<0.0218	<0.0227	<0.0216	<0.0214	<0.0319	<0.0212	<0.0256	<0.0265
PCB-1268	<0.0218	<0.0227	<0.0216	<0.0214	<0.0319	<0.0212	<0.0256	<0.0265
Toxaphene	<0.0218	<0.0227	<0.0216	<0.0214	<0.0319	<0.0212	<0.0256	<0.0265
Chlordane(tech)	<0.0598	<0.0623	<0.0595	<0.0588	<0.0876	<0.0583	<0.0704	<0.0728
Total Organic Carbon by EPA CRL SOP (%)								
%	<0.1	<0.1	<0.1	0.4	1.2	0.1	<0.1	0.9
Percent Solid by EPA CRL GCMS026 (%)								
%	86.9	85.5	89.1	87.3	60.9	90.7	74.4	71.5

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-09	S-10	S-11	S-12	S-13	S-14	S-15	S-16
Grain Size by ASTM Guidelines and EPA CRL AIG038 (%)								
Gravel	0.5	0.36	1.37	3.46	0.0	1.6	0.08	0.00
Coarse Sand	1.53	0.55	3.28	6.79	0.04	2.51	1.0	0.4
Medium Sand	17.26	3.48	25.9	70.07	0.48	8.5	7.1	0.74
Fine Sand	80.41	95.57	69.26	19.21	13.19	61.44	86.57	44.68
Silt and Clay	0.3	0.04	0.19	0.47	86.29	25.95	5.25	54.18
SVOCs by EPA CRL SOP (µg/Kg)								
1,2,4-Trichlorobenzene	<564	<572	<544	<552	<996	<561	<619	<848
1,2-Dichlorobenzene	<564	<572	<544	<552	<996	<561	<619	<848
1,3-Dichlorobenzene	<564	<572	<544	<552	<996	<561	<619	<848
1,4-Dichlorobenzene	<564	<572	<544	<552	<996	<561	<619	<848
2,4,6-Trichlorophenol	<564	<572	<544	<552	<996	<561	<619	<848
2,4,5-Trichlorophenol	<564	<572	<544	<552	<996	<561	<619	<848
2,4-Dichlorophenol	<564	<572	<544	<552	<996	<561	<619	<848
2,4-Dimethylphenol	<564	<572	<544	<552	<996	<561	<619	<848
2,4-Dinitrophenol	<564	<572	<544	<552	<996	<561	<619	<848
2,4-Dinitrotoluene	<564	<572	<544	<552	<996	<561	<619	<848
2,6-Dinitrotoluene	<564	<572	<544	<552	<996	<561	<619	<848
2-Chloronaphthalene	<564	<572	<544	<552	<996	<561	<619	<848
2-Chlorophenol	<564	<572	<544	<552	<996	<561	<619	<848
2-Methylnaphthalene	<564	<572	<544	<552	<996	<561	<619	<848
2-Nitroaniline	<564	<572	<544	<552	<996	<561	<619	<848
2-Nitrophenol	<564	<572	<544	<552	<996	<561	<619	<848
3,3-Dichlorobenzidine	<564	<572	<544	<552	<996	<561	<619	<848
3-Nitroaniline	<564	<572	<544	<552	<996	<561	<619	<848
4,6-Dinitro-2-methylphenol	<564	<572	<544	<552	<996	<561	<619	<848
4-Bromophenylphenyl ether	<564	<572	<544	<552	<996	<561	<619	<848
4-Chloroaniline	<564	<572	<544	<552	<996	<561	<619	<848
4-Chloro-3-methylphenol	<564	<572	<544	<552	<996	<561	<619	<848
4-Chlorophenyl phenyl ether	<564	<572	<544	<552	<996	<561	<619	<848
4-Nitrophenol	<564	<572	<544	<552	<996	<561	<619	<848
Acenaphthene	<564	<572	<544	<552	<996	<561	<619	<848
Acenaphthylene	<564	<572	<544	<552	<996	<561	<619	<848
Anthracene	<564	<572	<544	<552	<996	<561	<619	<848
Benzo(a)anthracene	<564	<572	<544	<552	<996	<561	<619	<848
Benzo(a)pyrene	<564	<572	<544	<552	<996	<561	<619	<848
Benzo(b)fluoranthene	<564	<572	<544	<552	<996	<561	<619	<848
Benzo(g,h,i)perylene	<564	<572	<544	<552	<996	<561	<619	<848
Benzo(k)fluoranthene	<564	<572	<544	<552	<996	<561	<619	<848
Benzyl alcohol	<564	<572	<544	<552	Rejected	Rejected	Rejected	Rejected
Bis(2-chloroethoxy) methane	<564	<572	<544	<552	<996	<561	<619	<848
Bis(2-chloroethyl)ether	<564	<572	<544	<552	<996	<561	<619	<848
Bis(2-ethylhexyl) phthalate	<564	<572	<544	<552	<996	<561	<619	<848
Bis(2-chloroisopropyl)ether	<564	<572	<544	<552	<996	<561	<619	<848
Butyl benzyl phthalate	<564	<572	<544	<552	<996	<561	<619	<848

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-09	S-10	S-11	S-12	S-13	S-14	S-15	S-16
Carbazole	<564	<572	<544	<552	<996	<561	<619	<848
Chrysene	<564	<572	<544	<552	<996	<561	<619	<848
Dibenzo(a,h)anthracene	<564	<572	<544	<552	<996	<561	<619	<848
Dibenzofuran	<564	<572	<544	<552	<996	<561	<619	<848
Diethyl phthalate	<564	<572	<544	<552	<996	<561	<619	<848
Dimethyl phthalate	<564	<572	<544	<552	<996	<561	<619	<848
Di-n-butyl phthalate	<564	<572	<544	<552	<996	<561	<619	<848
Di-n-octylphthalate	<564	<572	<544	<552	<996	<561	<619	<848
Fluoranthene	<564	<572	<544	<552	<996	<561	<619	<848
Fluorene	<564	<572	<544	<552	<996	<561	<619	<848
Hexachlorobenzene	<564	<572	<544	<552	<996	<561	<619	<848
Hexachlorobutadiene	<564	<572	<544	<552	<996	<561	<619	<848
Hexachloro-cyclopentadiene	<564	<572	<544	<552	Rejected	<561	<619	<848
Hexachloroethane	<564	<572	<544	<552	<996	<561	<619	<848
Indeno(1,2,3-cd)pyrene	<564	<572	<544	<552	<996	<561	<619	<848
Isophorone	<564	<572	<544	<552	<996	<561	<619	<848
2-Methylphenol	<564	<572	<544	<552	<996	<561	<619	<848
3-Methylphenol	<1130	<1140	<1060	<1100	<1990	<1120	<1240	<1700
4-Methylphenol	<1130	<1140	<1060	<1100	<1990	<1120	<1240	<1700
Naphthalene	<684	<693	<660	<669	<1210	<680	<750	<1030
Nitrobenzene	<564	<572	<544	<552	<996	<561	<619	<848
n-Nitroso-di-n-propylamine	<564	<572	<544	<552	<996	<561	<619	<848
n-Nitrosodiphenylamine	<564	<572	<544	<552	<996	<561	<619	<848
Pentachlorophenol	<564	<572	<544	<552	<996	<561	<619	<848
Phenanthrene	<564	<572	<544	<552	<996	<561	<619	<848
Phenol	<564	<572	<544	<552	<996	<561	<619	<848
Pyrene	<564	<572	<544	<552	<996	<561	<619	<848
VOCs by EPA CRL SOP GCMS001 (µg/kg)								
Acetone	41.6	41.0	<30.7	26.8	104	31.1	88.4	109
Acrolein	<195	<149	<30.7	<25.2	<52.7 R	<30.6 R	<36.9 R	<35.2 R
Acrylonitrile	<39.0	<29.7	<30.7	<25.2	<52.7	<30.6	<36.9	<35.2
Benzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
bis(Chloromethyl)ether	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Bromobenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Bromochloromethane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Bromodichloromethane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Bromoform	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Bromomethane	<39	<29.7	<30.7	<25.2	<52.7	<30.6	<36.9	<35.2
2-Butanone (MEK)	<39	<29.7	<30.7	<25.2	<52.7	<30.6	<36.9	<35.2
n-Butylbenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
sec-Butylbenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
tert-Butylbenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Carbon disulfide	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	9.42	<7.03
Carbon tetrachloride	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Chlorobenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Chloroethane	<15.6	<11.9	<12.3	<10.1	27.6	<12.3	<14.8	<14.1
1,2-Dichlorobenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Chloroform	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Chloromethane	<15.6	<11.9	<12.3	<10.1	<21.1	<12.3	<14.8	<14.1

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-09	S-10	S-11	S-12	S-13	S-14	S-15	S-16
2-Chlorotoluene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
4-Chlorotoluene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Dibromochloromethane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,2-Dibromo-3-chloropropane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,2-Dibromoethane (EDB)	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Dibromomethane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,3-Dichlorobenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,4-Dichlorobenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,1-Dichloroethane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,2-Dichloroethane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,1-Dichloroethene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
cis-1,2-Dichloroethene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
trans-1,2-Dichloroethene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,2-Dichloropropane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,3-Dichloropropane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
2,2-Dichloropropane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,1-Dichloropropene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
cis-1,3-Dichloropropene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
trans-1,3-Dichloropropene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,2-Dimethylbenzene (o-xylene)	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,3-Dimethylbenzene (m-xylene)	<15.6	<11.9	<12.3	<10.1	<21.1	<12.3	<14.8	<14.1
1,4-Dimethylbenzene (p-xylene)	<15.6	<11.9	<12.3	<10.1	<21.1	<12.3	<14.8	<14.1
Ethylbenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Hexachlorobutadiene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
2-Hexanone	<15.6	<11.9	<12.3	<10.1	<21.1	<12.3	<14.8	<14.1
Isopropylbenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
p-Isopropyltoluene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Methylene chloride	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
4-Methyl-2-pentanone	<15.6	<11.9	<12.3	<10.1	<21.1	<12.3	<14.8	<14.1
n-Propylbenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Styrene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,1,1,2-Tetrachloroethane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,1,2,2-Tetrachloroethane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Tetrachloroethene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Toluene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,2,3-Trichlorobenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,2,4-Trichlorobenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,1,1-Trichloroethane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,1,2-Trichloroethane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
Trichloroethene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,2,3-Trichloropropane	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,2,4-Trimethylbenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03
1,3,5-Trimethylbenzene	<7.81	<5.94	<6.14	<5.05	<10.5	<6.13	<7.38	<7.03

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-09	S-10	S-11	S-12	S-13	S-14	S-15	S-16
Vinyl chloride	<15.6	<11.9	<12.3	<10.1	<21.1	<12.3	<14.8	<14.1

¹ **Bold denotes detected parameters**

R This qualifier denotes that the data is unusable for its intended purpose. (Note: analyte may or may not be present)

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-17	S-18	S-19	S-20	S-21	S-22	S-23	S-24
Chlorinated Herbicides by SW 846 Method 8151A (µg/kg)								
2,4 - D	<120	<130	<130	<110	<100	<130 UJ	<93 UJ	<120 UJ
Dalapon	<60	<64	<65	<53	<52	<64	<46	<58
2,4 - DB	<120	<130	<130	<110	<100	<130	<93	<120
Dicamba	<60	<64	<65	<53	<52	<64	<46	<58
Dichloroprop	<120	<130	<130	<110	<100	<130	<93	<120
Dinoseb	<18	<19	<19	<16	<16	<19	<14	<17
MCPA	<12000	<13000	<13000	<11000	<10000	<13000	<9300	<12000
MCPP	<12000	<13000	<13000	<11000	<10000	<13000	<9300	<12000
Pentachlorophenol	<15	<16	<16	<13	<13	<16	<12	<14
2,4,5 - TP (Silvex)	<30	<32	<32	<26	<26	<32 UJ	<23	<29
2,4,5 - T	<30	<32	<32	<26	<26	<32 UJ	<23	<29
Pesticides by CRL SOP GC001 (mg/kg)								
Alpha-BHC	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
Gamma-BHC	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
Beta-BHC	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
Heptachlor	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
Delta-BHC	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308 UJ	<0.00229 UJ	<0.00282 UJ
Aldrin	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
Heptachlor epoxide	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	0.00527
Gamma-Chloradane	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
Alpha-Chloradane	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
Endosulfan I	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308 UJ	<0.00229 UJ	<0.00282 UJ
4,4-DDE	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
Dieldrin	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
Endrin	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
4,4'-DDD	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	0.0233
Endosulfan II	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
4,4'DDT	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	0.00955
Endrin aldehyde	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308 UJ	<0.00229 UJ	<0.00282 UJ
Endosulfan Sulfate	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
Methoxychlor	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
Endrin Ketone	<0.00283	<0.00299	<0.00307	<0.00246	<0.00269	<0.00308	<0.00229	<0.00282
PCBs by EPA CRL SOP (mg/Kg)								
PCB-1016	<0.0551	<0.0583	<0.0598	<0.0479	<0.0524	<0.0600	<0.0447	0.148 J
PCB-1221	<0.0283	<0.0299	<0.0307	<0.0246	<0.0269	<0.0308	<0.0229	<0.0282
PCB-1232	<0.0283	<0.0299	<0.0307	<0.0246	<0.0269	<0.0308	<0.0229	<0.0282
PCB-1242	<0.0283	<0.0299	<0.0307	<0.0246	<0.0269	<0.0308	<0.0229	<0.0282
PCB-1248	<0.0283	<0.0299	<0.0307	<0.0246	<0.0269	<0.0308	<0.0229	<0.0282
PCB-1254	<0.0283	<0.0299	<0.0307	<0.0246	<0.0269	<0.0308	<0.0229	<0.0282
PCB-1260	<0.0283	<0.0299	<0.0307	<0.0246	<0.0269	<0.0308	<0.0229	0.193
PCB-1262	<0.0283	<0.0299	<0.0307	<0.0246	<0.0269	<0.0308	<0.0229	<0.0282
PCB-1268	<0.0283	<0.0299	<0.0307	<0.0246	<0.0269	<0.0308	<0.0229	<0.0282
Toxaphene	<0.0283	<0.0299	<0.0307	<0.0246	<0.0269	<0.0308	<0.0229	<0.0282
Chlordane(tech)	<0.0777	<0.0822	<0.0844	<0.0676	<0.0740	<0.0846	<0.0630	<0.0775
Total Organic Carbon by EPA CRL SOP (%)								
%	1.4	<0.1	1.2	0.1	0.7	1.1 J	<1.2 J	0.4 J

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-17	S-18	S-19	S-20	S-21	S-22	S-23	S-24
Percent Solid by EPA CRL GCMS026 (%)								
%	68.0	61.7	61.8	76.1	72.9	62.9	86.9	70.3
Grain Size by ASTM Guidelines and EPA CRL AIG038 (%)								
Gravel	0.01	0.03	0.02	0.71	0.17	0.22	1.06	0.03
Coarse Sand	0.19	0.08	0.09	0.3	0.09	0.2	0.91	0.15
Medium Sand	1.32	0.05	0.08	1.31	1.3	1.66	6.66	1.31
Fine Sand	19.22	1.31	2.04	32.45	30.77	11.5	82.16	33.58
Silt and Clay	79.26	98.53	97.77	65.23	67.67	86.42	9.21	64.93
SVOCs by EPA CRL SOP (µg/Kg)								
1,2,4-Trichlorobenzene	<3910	<1030	<830	<673	<791	<3210	<597	<658
1,2-Dichlorobenzene	<3910	<1030	<830	<673	<791	<3210	<597	<658
1,3-Dichlorobenzene	<3910	<1030	<830	<673	<791	<3210	<597	<658
1,4-Dichlorobenzene	<3910	<1030	<830	<673	<791	<3210	<597	<658
2,4,6-Trichlorophenol	<3910	<1030	<830	<673	<791	<3210	<597	<658
2,4,5-Trichlorophenol	<3910	<1030	<830	<673	<791	<3210	<597	<658
2,4-Dichlorophenol	<3910	<1030	<830	<673	<791	<3210	<597	<658
2,4-Dimethylphenol	<3910	<1030	<830	<673	<791	<3210	<597	<658
2,4-Dinitrophenol	<3910	<1030	<830	<673	<791	<3210 UJ	<597 UJ	<658 UJ
2,4-Dinitrotoluene	<3910	<1030	<830	<673	<791	<3210	<597	<658
2,6-Dinitrotoluene	<3910	<1030	<830	<673	<791	<3210	<597	<658
2-Chloronaphthalene	<3910	<1030	<830	<673	<791	<3210	<597	<658
2-Chlorophenol	<3910	<1030	<830	<673	<791	<3210	<597	<658
2-Methylnaphthalene	<3910	<1030	<830	<673	<791	<3210	<597	<658
2-Nitroaniline	<3910	<1030	<830	<673	<791	<3210	<597	<658
2-Nitrophenol	<3910	<1030	<830	<673	<791	<3210	<597	<658
3,3-Dichlorobenzidine	<3910	<1030	<830	<673	<791	<3210	<597	<658
3-Nitroaniline	<3910	<1030	<830	<673	<791	<3210 UJ	<597 UJ	<658 UJ
4,6-Dinitro-2-methylphenol	<3910	<1030	<830	<673	<791	<3210 J	<597 J	<658 J
4-Bromophenylphenyl ether	<3910	<1030	<830	<673	<791	<3210	<597	<658
4-Chloroaniline	<3910	<1030	<830	<673	<791	<3210 J	<597 J	<658 J
4-Chloro-3-methylphenol	<3910	<1030	<830	<673	<791	<3210	<597	<658
4-Chlorophenyl phenyl ether	<3910	<1030	<830	<673	<791	<3210	<597	<658
4-Nitrophenol	<3910	<1030	<830	<673	<791	<3210 UJ	<597 UJ	<658 UJ
Acenaphthene	<3910	<1030	<830	<673	<791	<3210	<597	<658
Acenaphthylene	<3910	<1030	<830	<673	<791	<3210	<597	<658
Anthracene	<3910	<1030	<830	<673	<791	<3210	<597	<658
Benzo(a)anthracene	<3910	<1030	<830	<673	<791	<3210	<597	<658
Benzo(a)pyrene	<3910	<1030	<830	<673	<791	<3210	<597	<658
Benzo(b)fluoranthene	<3910	<1030	<830	<673	<791	<3210	<597	<658
Benzo(g,h,i)perylene	<3910	<1030	<830	<673	<791	<3210 J	<597 J	<658 J
Benzo(k)fluoranthene	<3910	<1030	<830	<673	<791	<3210 L	<597 L	<658 L
Benzyl alcohol	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected
Bis(2-chloroethoxy) methane	<3910	<1030	<830	<673	<791	<3210	<597	<658
Bis(2-chloroethyl)ether	<3910	<1030	<830	<673	<791	<3210	<597	<658
Bis(2-ethylhexyl) phthalate	<3910	<1030	<830	<673	<791	<3210 L	<597 L	<658 L

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-17	S-18	S-19	S-20	S-21	S-22	S-23	S-24
Bis(2-chloroisopropyl) ether	<3910	<1030	<830	<673	<791	<3210	<597	<658
Butyl benzyl phthalate	<3910	<1030	<830	<673	<791	<3210	<597	<658
Carbazole	<3910	<1030	<830	<673	<791	<3210	<597	<658
Chrysene	<3910	<1030	<830	<673	<791	<3210	<597	<658
Dibenzo(a,h)anthracene	<3910	<1030	<830	<673	<791	<3210 J	<597 J	<658 J
Dibenzofuran	<3910	<1030	<830	<673	<791	<3210	<597	<658
Diethyl phthalate	<3910	<1030	<830	<673	<791	<3210 L	<597 L	<658 L
Dimethyl phthalate	<3910	<1030	<830	<673	<791	<3210	<597	<658
Di-n-butyl phthalate	<3910	<1030	<830	<673	<791	<3210 L	<597 L	<658 L
Di-n-octylphthalate	<3910	<1030	<830	<673	<791	<3210 L	<597 L	<658 L
Fluoranthene	<3910	<1030	<830	<673	<791	<3210 L	<597 L	<658 L
Fluorene	<3910	<1030	<830	<673	<791	<3210	<597	<658
Hexachlorobenzene	<3910	<1030	<830	<673	<791	<3210	<597	<658
Hexachlorobutadiene	<3910	<1030	<830	<673	<791	<3210	<597	<658
Hexachloro-cyclopentadiene	<3910	<1030	<830	<673	<791	<3210 R	<597 R	<658 R
Hexachloroethane	<3910	<1030	<830	<673	<791	<3210 J	<597 J	<658 J
Indeno(1,2,3-cd)pyrene	<3910	<1030	<830	<673	<791	<3210 J	<597 J	<658 J
Isophorone	<3910	<1030	<830	<673	<791	<3210	<597	<658
2-Methylphenol	<3910	<1030	<830	<673	<791	<3210	<597	<658
3-Methylphenol	<7830	<2060	<1660	<1350	<1580	<6420	<1190	<1320
4-Methylphenol	<7830	<2060	<1660	<1350	<1580	<6420	<1190	<1320
Naphthalene	<4740	<1250	<1010	<815	<959	<3890	<724	<798
Nitrobenzene	<3910	<1030	<830	<673	<791	<3210	<597	<658
n-Nitroso-di-n-propylamine	<3910	<1030	<830	<673	<791	<3210	<597	<658
n-Nitrosodiphenylamine	<3910	<1030	<830	<673	<791	<3210	<597	<658
Pentachlorophenol	<3910	<1030	<830	<673	<791	<3210 UJ	<597 UJ	<658 UJ
Phenanthrene	<3910	<1030	<830	<673	<791	<3210 L	<597 L	<658 L
Phenol	<3910	<1030	<830	<673	<791	<3210	<597	<658
Pyrene	<3910	<1030	<830	<673	<791	<3210	<597	<658
VOCs by EPA CRL SOP GCMS001 (µg/kg)								
Acetone	134	175	198	121	122	187 J	44.1 J	121 J
Acrolein	<43.8 R	<47.7 R	69.2 R	<30.2 R	<33.7 R	105 R	<24.9 R	<38.3 R
Acrylonitrile	<43.8	<47.7	<50.3	<30.5	<33.7	<44.8	<24.9	<38.3
Benzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
bis(Chloromethyl)ether	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Bromobenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Bromochloromethane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Bromodichloromethane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Bromoform	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Bromomethane	<43.8	<47.7	<50.3	<30.5	<33.7	<44.8 UJ	<24.9 UJ	<38.3 UJ
2-Butanone (MEK)	<43.8	<47.7	<50.3	<30.5	<33.7	<44.8	<24.9	<38.3
n-Butylbenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
sec-Butylbenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 J	<4.97 J	<7.67 J
tert-Butylbenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Carbon disulfide	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 J	<4.97 J	9.50 J
Carbon tetrachloride	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Chlorobenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Chloroethane	<17.5	<19.1	<20.1	<12.2	<13.5	<17.9	<9.95	<15.3

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-17	S-18	S-19	S-20	S-21	S-22	S-23	S-24
1,2-Dichlorobenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Chloroform	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Chloromethane	<17.5	<19.1	<20.1	<12.2	<13.5	<17.9 L	<9.95 L	<15.3 L
2-Chlorotoluene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
4-Chlorotoluene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 J	<4.97 J	<7.67 J
Dibromochloromethane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,2-Dibromo-3-chloropropane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,2-Dibromoethane (EDB)	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Dibromomethane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,3-Dichlorobenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 J	<4.97 J	<7.67 J
1,4-Dichlorobenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 J	<4.97 J	8.34 J
1,1-Dichloroethane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,2-Dichloroethane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,1-Dichloroethene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
cis-1,2-Dichloroethene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
trans-1,2-Dichloroethene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,2-Dichloropropane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,3-Dichloropropane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
2,2-Dichloropropane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,1-Dichloropropene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
cis-1,3-Dichloropropene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
trans-1,3-Dichloropropene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,2-Dimethylbenzene (o-xylene)	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,3-Dimethylbenzene (m-xylene)	<17.5	<19.1	<20.1	<12.2	<13.5	<17.9	<9.95	<15.3
1,4-Dimethylbenzene (p-xylene)	<17.5	<19.1	<20.1	<12.2	<13.5	<17.9	<9.95	<15.3
Ethylbenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Hexachlorobutadiene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 J	<4.97 J	<7.67 J
2-Hexanone	<17.5	<19.1	<20.1	<12.2	<13.5	<17.9 K	<9.95 K	<15.3 K
Isopropylbenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
p-Isopropyltoluene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 J	<4.97 J	<7.67 J
Methylene chloride	<8.75	<9.54	<10.1	<6.09	9.90	<8.96	<4.97	<7.67
4-Methyl-2-pentanone	<17.5	<19.1	<20.1	<12.2	<13.5	<17.9	<9.95	<15.3
n-Propylbenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 J	<4.97 J	<7.67 J
Styrene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 J	<4.97 J	<7.67 J
1,1,1,2-Tetrachloroethane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,1,2,2-Tetrachloroethane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Tetrachloroethene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 J	<4.97 J	<7.67 J
Toluene	12.2	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,2,3-Trichlorobenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,2,4-Trichlorobenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 J	<4.97 J	<7.67 J
1,1,1-Trichloroethane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
1,1,2-Trichloroethane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	<7.67
Trichloroethene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 L	<4.97 L	<7.67 L

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹							
	S-17	S-18	S-19	S-20	S-21	S-22	S-23	S-24
1,2,3-Trichloropropane	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96	<4.97	12.8
1,2,4-Trimethylbenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 J	<4.97 J	<7.67 J
1,3,5-Trimethylbenzene	<8.75	<9.54	<10.1	<6.09	<6.74	<8.96 J	<4.97 J	<7.67 J
Vinyl chloride	<17.5	<19.1	<20.1	<12.2	<13.5	<17.9	<9.95	<15.3

¹ **Bold denotes detected parameters**

R This qualifier denotes that the data is unusable for its intended purpose. (Note: analyte may or may not be present)

J This qualifier denotes that the analyte or compound is present, but at an estimated concentration.

L This qualifier denotes that the analyte or compound is present, but the reported concentration may be biased low.

U This qualifier denotes that the analyte or compound was not detected at the indicated reporting limit.
Bold denotes detected parameters

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹						
	S-25	S-26	S-27	S-28	S-29	S-30	S-31
Chlorinated Herbicides by SW 846 Method 8151A (µg/kg)							
2,4 - D	<99	<130 UJ	<120 UJ	<110	<97	<100	<95
Dalapon	<49	<64	<59	<54	<49	<52	<47
2,4 - DB	<99	<130	<120	<110	<97	<100	<95
Dicamba	<49	<64	<59	<54	<49	<52	<47
Dichloroprop	<99	<130	<120	<110	<97	<100	<95
Dinoseb	<15	<19	<18	<16	<15	<16	<14
MCPA	<9900	<13000	<12000	<11000	<9700	<10000	<9500
MCPP	<9900	<13000	<12000	<11000	<9700	<10000	<9500
Pentachlorophenol	<12	<16	<15	<13	<12	<13	<12
2,4,5 - TP (Silvex)	<25	<32	<30	<27	<24	<26	<24
2,4,5 - T	<25	<32	<30	<27	<24	<26	<24
Pesticides by CRL SOP GC001 (mg/kg)							
Alpha-BHC	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
Gamma-BHC	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
Beta-BHC	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
Heptachlor	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
Delta-BHC	<0.00242	<0.00285 UJ	<0.00295 UJ	<0.00256	<0.00239	<0.00242	<0.00257
Aldrin	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
Heptachlor epoxide	<0.00242	0.0280	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
Gamma-Chloradane	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
Alpha-Chloradane	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
Endosulfan I	<0.00242	<0.00285 UJ	<0.00295 UJ	<0.00256	<0.00239	<0.00242	<0.00257
4,4-DDE	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
Dieldrin	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
Endrin	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
4,4'-DDD	<0.00242	0.162	0.0405 J	<0.00256	<0.00239	<0.00242	<0.00257
Endosulfan II	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
4,4'DDT	<0.00242	0.00739	0.00401 J	<0.00256	<0.00239	<0.00242	<0.00257
Endrin aldehyde	<0.00242	<0.00285 UJ	<0.00295 UJ	<0.00256	<0.00239	<0.00242	<0.00257
Endosulfan Sulfate	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
Methoxychlor	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
Endrin Ketone	<0.00242	<0.00285	<0.00295	<0.00256	<0.00239	<0.00242	<0.00257
PCBs by EPA CRL SOP (mg/Kg)							
PCB-1016	<0.0473	0.128 J	<0.0575	<0.0499	<0.0465	<0.0472	<0.0501
PCB-1221	<0.0242	<0.0285	<0.0295	<0.0256	<0.0239	<0.0242	<0.0257
PCB-1232	<0.0242	<0.0285	<0.0295	<0.0256	<0.0239	<0.0242	<0.0257
PCB-1242	<0.0242	<0.0285	<0.0295	<0.0256	<0.0239	<0.0242	<0.0257
PCB-1248	<0.0242	<0.0285	<0.0295	<0.0256	<0.0239	<0.0242	<0.0257
PCB-1254	<0.0242	<0.0285	<0.0295	<0.0256	<0.0239	<0.0242	<0.0257
PCB-1260	<0.0242	0.229	<0.0295	<0.0256	<0.0239	<0.0242	<0.0257
PCB-1262	<0.0242	<0.0285	<0.0295	<0.0256	<0.0239	<0.0242	<0.0257
PCB-1268	<0.0242	<0.0285	<0.0295	<0.0256	<0.0239	<0.0242	<0.0257
Toxaphene	<0.0242	<0.0285	<0.0295	<0.0256	<0.0239	<0.0242	<0.0257
Chlordane(tech)	<0.0666	<0.0783	<0.0811	<0.0704	<0.0656	<0.0666	<0.0707
Total Organic Carbon by EPA CRL SOP (%)							
%	0.1	1.1 J	0.9 J	0.7	0.2	0.6	0.6

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹						
	S-25	S-26	S-27	S-28	S-29	S-30	S-31
Percent Solid by EPA CRL GCMS026 (%)							
%	79.5	66.8	64.3	74.4	79.3	82.2	76.2
Grain Size by ASTM Guidelines and EPA CRL AIG038 (%)							
Gravel	0.0	0.0	0.02	0.0	0.00	0.04	0.45
Coarse Sand	0.14	0.11	0.11	0.22	0.09	0.03	0.72
Medium Sand	0.76	0.07	0.22	0.51	1.03	0.05	0.92
Fine Sand	75.32	1.62	0.94	4.9	21.03	0.66	15.61
Silt and Clay	23.78	98.2	98.71	94.37	77.85	99.22	82.3
SVOCs by EPA CRL SOP (µg/Kg)							
1,2,4-Trichlorobenzene	<625	<839	<871	<608	<638	<3050	<693
1,2-Dichlorobenzene	<625	<839	<871	<608	<638	<3050	<693
1,3-Dichlorobenzene	<625	<839	<871	<608	<638	<3050	<693
1,4-Dichlorobenzene	<625	<839	<871	<608	<638	<3050	<693
2,4,6-Trichlorophenol	<625	<839	<871	<608	<638	<3050	<693
2,4,5-Trichlorophenol	<625	<839	<871	<608	<638	<3050	<693
2,4-Dichlorophenol	<625	<839	<871	<608	<638	<3050	<693
2,4-Dimethylphenol	<625	<839	<871	<608	<638	<3050	<693
2,4-Dinitrophenol	<625	<839 UJ	<871 UJ	<608	<638	<3050	<693
2,4-Dinitrotoluene	<625	<839	<871	<608	<638	<3050	<693
2,6-Dinitrotoluene	<625	<839	<871	<608	<638	<3050	<693
2-Chloronaphthalene	<625	<839	<871	<608	<638	<3050	<693
2-Chlorophenol	<625	<839	<871	<608	<638	<3050	<693
2-Methylnapthalene	<625	<839	<871	<608	<638	<3050	<693
2-Nitroaniline	<625	<839	<871	<608	<638	<3050	<693
2-Nitrophenol	<625	<839	<871	<608	<638	<3050	<693
3,3-Dichlorobenzidine	<625	<839	<871	<608	<638	<3050	<693
3-Nitroaniline	<625	<839 UJ	<871 UJ	<608	<638	<3050	<693
4,6-Dinitro-2-methylphenol	<625	<839 J	<871 J	<608	<638	<3050	<693
4-Bromophenylphenyl ether	<625	<839	<871	<608	<638	<3050	<693
4-Chloroaniline	<625	<839 J	<871 J	<608	<638	<3050	<693
4-Chloro-3-methylphenol	<625	<839	<871	<608	<638	<3050	<693
4-Chlorophenyl phenyl ether	<625	<839	<871	<608	<638	<3050	<693
4-Nitrophenol	<625	<839 UJ	<871 UJ	<608	<638	<3050	<693
Acenaphthene	<625	<839	<871	<608	<638	<3050	<693
Acenaphthylene	<625	<839	<871	<608	<638	<3050	<693
Anthracene	<625	<839	<871	<608	<638	<3050	<693
Benzo(a)anthracene	<625	<839	<871	<608	<638	<3050	<693
Benzo(a)pyrene	<625	<839	<871	<608	<638	<3050	<693
Benzo(b)fluoranthene	<625	<839	<871	<608	<638	<3050	<693
Benzo(g,h,i)perylene	<625	<839 J	<871 J	<608	<638	<3050	<693
Benzo(k)fluoranthene	<625	<839 L	<871 L	<608	<638	<3050	<693
Benzyl alcohol	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected
Bis(2-chloroethoxy) methane	<625	<839	<871	<608	<638	<3050	<693
Bis(2-chloroethyl)ether	<625	<839	<871	<608	<638	<3050	<693
Bis(2-ethylhexyl) phthalate	<625	<839 L	<871 L	<608	<638	<3050	<693

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹						
	S-25	S-26	S-27	S-28	S-29	S-30	S-31
Bis(2-chloroisopropyl)ether	<625	<839	<871	<608	<638	<3050	<693
Butyl benzyl phthalate	<625	<839	<871	<608	<638	<3050	<693
Carbazole	<625	<839	<871	<608	<638	<3050	<693
Chrysene	<625	<839	<871	<608	<638	<3050	<693
Dibenzo(a,h)anthracene	<625	<839 J	<871 J	<608	<638	<3050	<693
Dibenzofuran	<625	<839	<871	<608	<638	<3050	<693
Diethyl phthalate	<625	<839 L	<871 L	<608	<638	<3050	<693
Dimethyl phthalate	<625	<839	<871	<608	<638	<3050	<693
Di-n-butyl phthalate	<625	<839 L	<871 L	<608	<638	<3050	<693
Di-n-octylphthalate	<625	<839 L	<871 L	<608	<638	<3050	<693
Fluoranthene	<625	<839 L	<871 L	<608	<638	<3050	<693
Fluorene	<625	<839	<871	<608	<638	<3050	<693
Hexachlorobenzene	<625	<839	<871	<608	<638	<3050	<693
Hexachlorobutadiene	<625	<839	<871	<608	<638	<3050	<693
Hexachloro-cyclopentadiene	<625	<839 R	<871 R	Rejected	<638	<3050	<693
Hexachloroethane	<625	<839 J	<871 J	<608	<638	<3050	<693
Indeno(1,2,3-cd)pyrene	<625	<839 J	<871 J	<608	<638	<3050	<693
Isophorone	<625	<839	<871	<608	<638	<3050	<693
2-Methylphenol	<625	<839	<871	<608	<638	<3050	<693
3-Methylphenol	<1250	<1680	<1740	<1220	<1280	<6090	<1390
4-Methylphenol	<1250	<1680	<1740	<1220	<1280	<6090	<1390
Naphthalene	<757	<1020	<1060	<737	<773	<3690	<839
Nitrobenzene	<625	<839	<871	<608	<638	<3050	<693
n-Nitroso-di-n-propylamine	<625	<839	<871	<608	<638	<3050	<693
n-Nitrosodiphenylamine	<625	<839	<871	<608	<638	<3050	<693
Pentachlorophenol	<625	<839 UJ	<871 UJ	<608	<638	<3050	<693
Phenanthrene	<625	<839 L	<871 L	<608	<638	<3050	<693
Phenol	<625	<839	<871	<608	<638	<3050	<693
Pyrene	<625	<839	<871	<608	<638	<3050	<693
VOCs by EPA CRL SOP GCMS001 (µg/kg)							
Acetone	61.1	113 J	79.5 J	<32.3	136	147	107
Acrolein	<29.8	<41.7 R	<54.7 R	<32.3	<29.9	<27.0	<30.3
Acrylonitrile	<29.8	<41.7	<54.7	<32.3	<29.9	<27.0	<30.3
Benzene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
bis(Chloromethyl)ether	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Bromobenzene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Bromochloromethane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Bromodichloromethane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Bromoform	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Bromomethane	<29.8	<41.7 UJ	<54.7 UJ	<32.3	<29.9	<27.0	<30.3
2-Butanone (MEK)	<29.8	<41.7	<54.7	<32.3	<29.9	<27.0	<30.3
n-Butylbenzene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
sec-Butylbenzene	<5.98	<8.34 J	<10.9 J	<6.46	<5.98	<5.41	<6.07
tert-Butylbenzene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Carbon disulfide	<5.98	8.54 J	<10.9 J	<6.46	7.89	<5.41	<6.07
Carbon tetrachloride	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Chlorobenzene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Chloroethane	<11.9	<16.7	<21.9	<12.9	<12.0	<10.8	<12.1

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹						
	S-25	S-26	S-27	S-28	S-29	S-30	S-31
1,2-Dichlorobenzene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Chloroform	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Chloromethane	<11.9	<16.7	<21.9	<12.9	<12.0	<10.8	<12.1
2-Chlorotoluene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
4-Chlorotoluene	<5.98	<8.34 J	<10.9 J	<6.46	<5.98	<5.41	<6.07
Dibromochloromethane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,2-Dibromo-3-chloropropane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,2-Dibromoethane (EDB)	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Dibromomethane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,3-Dichlorobenzene	<5.98	<8.34 J	<10.9 J	<6.46	<5.98	<5.41	<6.07
1,4-Dichlorobenzene	<5.98	9.48 J	<10.9 J	<6.46	<5.98	<5.41	<6.07
1,1-Dichloroethane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,2-Dichloroethane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,1-Dichloroethene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
cis-1,2-Dichloroethene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
trans-1,2-Dichloroethene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,2-Dichloropropane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,3-Dichloropropane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
2,2-Dichloropropane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,1-Dichloropropene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
cis-1,3-Dichloropropene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
trans-1,3-Dichloropropene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,2-Dimethylbenzene (o-xylene)	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,3-Dimethylbenzene (m-xylene)	<11.9	<16.7	<21.9	<12.9	<12.0	<10.8	<12.1
1,4-Dimethylbenzene (p-xylene)	<11.9	<16.7	<21.9	<12.9	<12.0	<10.8	<12.1
Ethylbenzene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Hexachlorobutadiene	<5.98	<8.34 J	<10.9 J	<6.46	<5.98	<5.41	<6.07
2-Hexanone	<11.9	<16.7 K	<21.9 K	<12.9	<12.0	<10.8	<12.1
Isopropylbenzene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
p-Isopropyltoluene	<5.98	<8.34 J	<10.9 J	<6.46	<5.98	<5.41	<6.07
Methylene chloride	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
4-Methyl-2-pentanone	<11.9	<16.7	<21.9	<12.9	<12.0	<10.8	<12.1
n-Propylbenzene	<5.98	<8.34 J	<10.9 J	<6.46	<5.98	<5.41	<6.07
Styrene	<5.98	<8.34 J	<10.9 J	<6.46	<5.98	<5.41	<6.07
1,1,1,2-Tetrachloroethane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,1,2,2-Tetrachloroethane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Tetrachloroethene	<5.98	<8.34 J	<10.9 J	<6.46	<5.98	<5.41	<6.07
Toluene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,2,3-Trichlorobenzene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,2,4-Trichlorobenzene	<5.98	<8.34 J	<10.9 J	<6.46	<5.98	<5.41	<6.07
1,1,1-Trichloroethane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,1,2-Trichloroethane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
Trichloroethene	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07

TABLE 4: Analytical Results (Continued)
Solutia Mississippi River Sediment Sampling

Compound	Sample Identification/Results ¹						
	S-25	S-26	S-27	S-28	S-29	S-30	S-31
1,2,3-Trichloropropane	<5.98	<8.34	<10.9	<6.46	<5.98	<5.41	<6.07
1,2,4-Trimethylbenzene	<5.98	<8.34 J	<10.9 J	<6.46	<5.98	<5.41	<6.07
1,3,5-Trimethylbenzene	<5.98	<8.34 J	<10.9 J	<6.46	<5.98	<5.41	<6.07
Vinyl chloride	<11.9	<16.7	<21.9	<12.9	<12.0	<10.8	<12.1

¹ Bold denotes detected parameters

R This qualifier denotes that the data is unusable for its intended purpose. (Note: analyte may or may not be present)

J This qualifier denotes that the analyte or compound is present, but at an estimated concentration.

L This qualifier denotes that the analyte or compound is present, but the reported concentration may be biased low.

U This qualifier denotes that the analyte or compound was not detected at the indicated reporting limit.
 Bold denotes detected parameters

TABLE 5: Detected Constituents and Associated Screening Levels
Solutia Sediment Sampling

Sample Number	Location ¹	Parameter ²	Concentration (mg/kg)	Screening Levels	
				PRGs ³ (mg/kg)	ESLs ⁴ (mg/kg)
S-01	Background Sample, Upstream from Site R 7.5 miles at River Mile (RM) 185.5	Benzo(a)pyrene	0.705	0.062	0.150
		Chloroethane	0.0196	3	NA
S-03	Downstream of Site R 3 miles at RM 175	Chloroethane	0.0291	3	NA
S-21	Downstream of Site R 6 miles at RM 172	Methylene Chloride	0.0099	9.1	0.159
S-26	Downstream of Site R 8 miles at RM 170	Heptachlor epoxide	0.0280	0.053	0.00247
		4,4'- DDD	0.162	2.4	0.00488
		4,4'- DDT	0.00739	1.7	0.00416
		PCB-1016	0.128	3.9	0.0598
		PCB- 1260	0.229	0.22	0.0598
		1,4-Dichlorobenzene	0.00948	3.4	0.318
S-27	Duplicate of S-26	4,4'- DDD	0.0405	2.4	0.00488
		4,4'- DDT	0.00401	1.7	0.00416
S-17	Downstream of Site R 8.5 miles at RM 169.5	Toluene	0.0122	520	1.22
S-24	Downstream of Site R 10.5 miles at RM 167.5, within Jefferson Barracks Chute	Heptachlor epoxide	0.00527	0.053	0.00237
		4,4'- DDD	0.0233	2.4	0.00488
		4,4'- DDT	0.00955	1.7	0.00416
		PCB-1016	0.148	3.9	0.0598
		PCB- 1260	0.193	0.22	0.0598
		1,4-Dichlorobenzene	0.00834	3.4	0.318
		1,2,3-Trichloropropane	0.0128	0.0340	NA
S-13	Downstream of Site R 12 miles at RM 166	Chloroethane	0.0276	3	NA

¹ Site R is located at River Mile 178.

² Bolded parameters denote concentrations that exceed the EPA Region 5 Ecological Screening Levels (ESLs) listed for sediment.

³ The EPA Region 9 Preliminary Remediation Goals (PRGs) listed are for the Residential Soil limits. The PRG does not take into consideration the bioaccumulative nature of the contaminant.

⁴ The ESLs listed are for sediment.

NA - Not Available

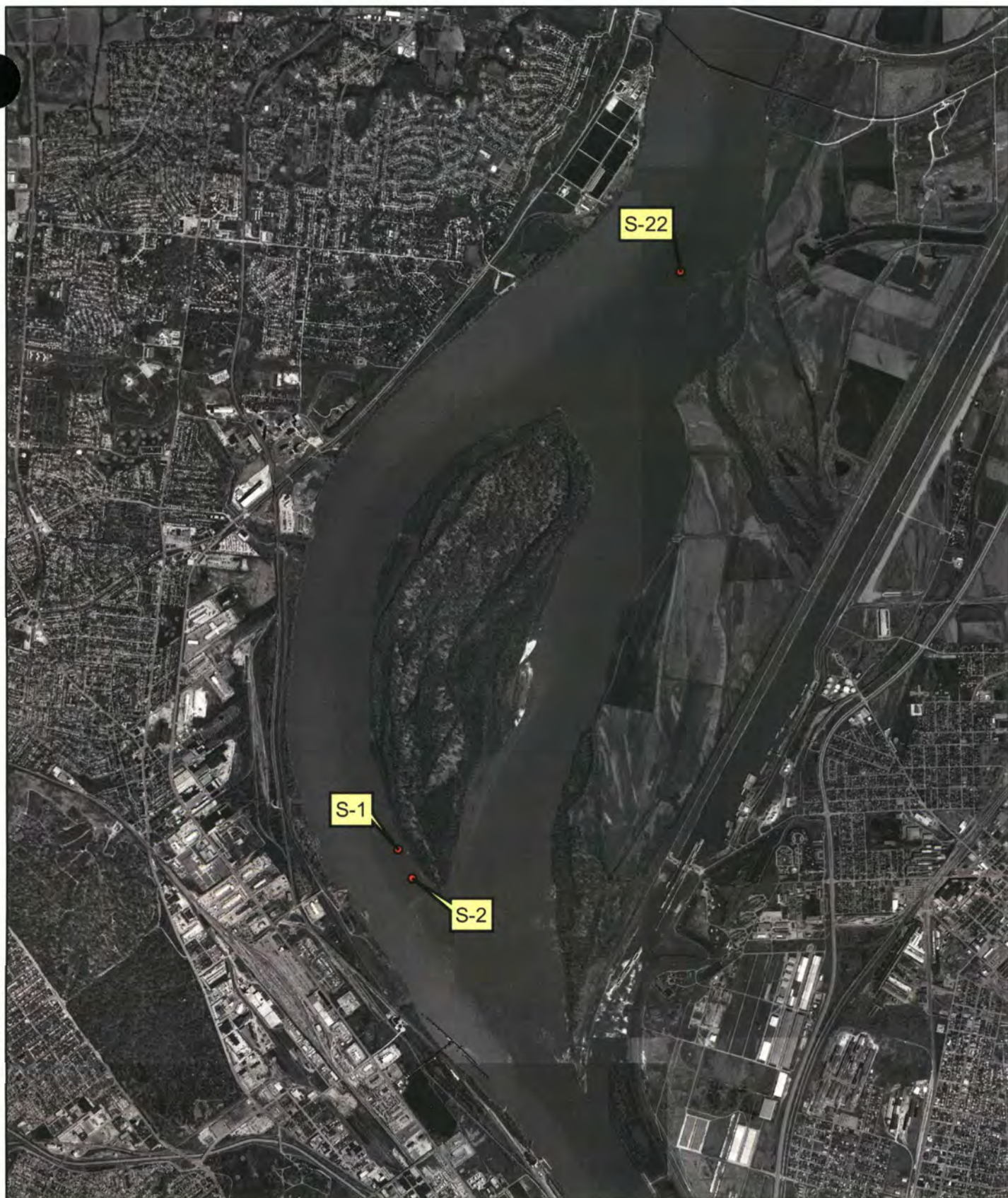
Table 6: Sediment Data by River Mile (RM)

EPA or Solutia* Sample Number	Sample Date	Sample Location	Total PCBs (ppb)	Heptachlor Epoxide (ppb)	4,4'-DDD (ppb)	4,4'-DDT (ppb)
PDA-5-60	October 2000	Middle of Site R (RM 178)	84	-	14	-
PDA-5*	October 2000	Middle of Site R (RM 178)	-	-	1.6	-
SD-5-150	October 2000	South half of Site R (RM 178)	120	-	-	-
PDA-3*	September 2005	South half of Site R (RM 178)	-	-	6.5	-
PDA-4*	September 2005	South half of Site R (RM 178)	-	-	1.15	-
SD-6-90	October 2000	South edge of Site R (RM 178)	31	-	-	-
SD-7-150	October 2000	South edge of Site R (RM 178)	20	-	-	-
R3AU1S*	November 2002	South edge of Site R (RM 178)	2.4	0.31	-	3.3

EPA or Solutia* Sample Number	Sample Date	Sample Location	Total PCBs (ppb)	Heptachlor Epoxide (ppb)	4,4'-DDD (ppb)	4,4'-DDT (ppb)
R3AM1S*	November 2002	Just south of Site R (RM 178)	5.7	-	-	-
R3BM1S*	November 2002	Just south of Site R (RM 178)	69.4	11	1.2	-
R3AD1S*	November 2002	Just south of Site R (RM 178)	4.56	0.61	-	-
R4BU1S*	November 2002	2250' south of Site R (RM 177.5)	-	-	0.96	3
R4BM1S*	November 2002	2250' south of Site R (RM 177.5)	8.9	-	-	-
R5AU1S*	November 2002	4500' south of Site R (RM 177)	-	-	-	0.5
S-26	October 2005	8 miles south of Site R (RM 170)	357	28.0	162	7.39
S-27 (duplicate of S-26)	October 2005	8 miles south of Site R (RM 170)	-	-	40.5	4.01
S-24	October 2005	10.5 miles south of Site R (RM 167.5)	341	5.27	23.3	9.55

APPENDIX A: AERIAL PHOTOGRAPHS AND HYDROGRAPHIC MAPS

AERIAL PHOTOGRAPHS



0 500 1,000 2,000 3,000 4,000 Meters

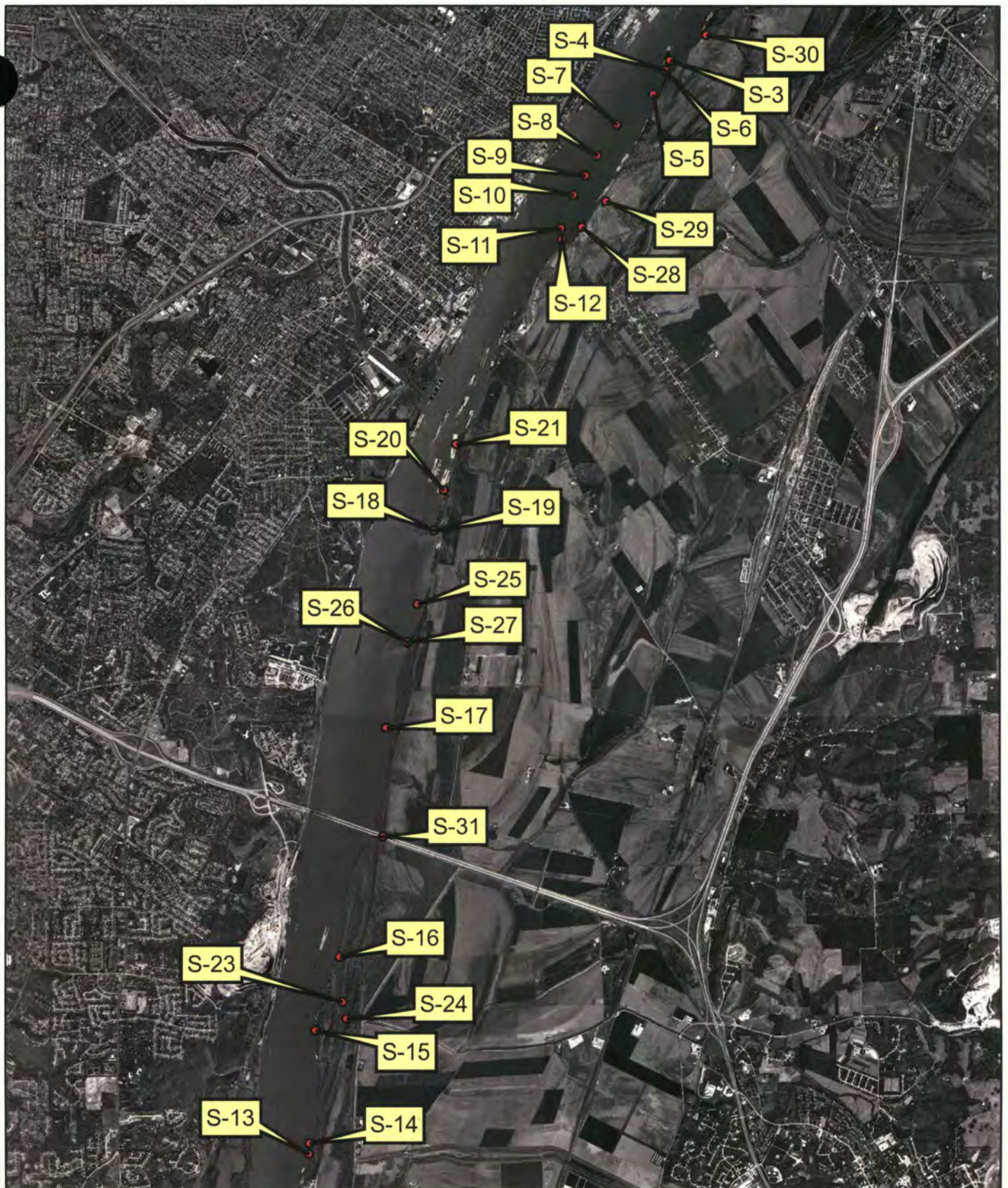
Legend

● Sample Sites

Solutia Inc.
Mississippi River Sediment Sample Locations (North)

* Aerial photo downloaded @ www.terra-server.com

Booz | Allen | Hamilton



0 875 1,750 3,500 5,250 7,000 Meters

Solutia Inc.

Mississippi River Sediment Sample Locations (South)

* Aerial photo downloaded @ www.terraserver.com

Legend

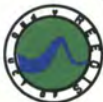
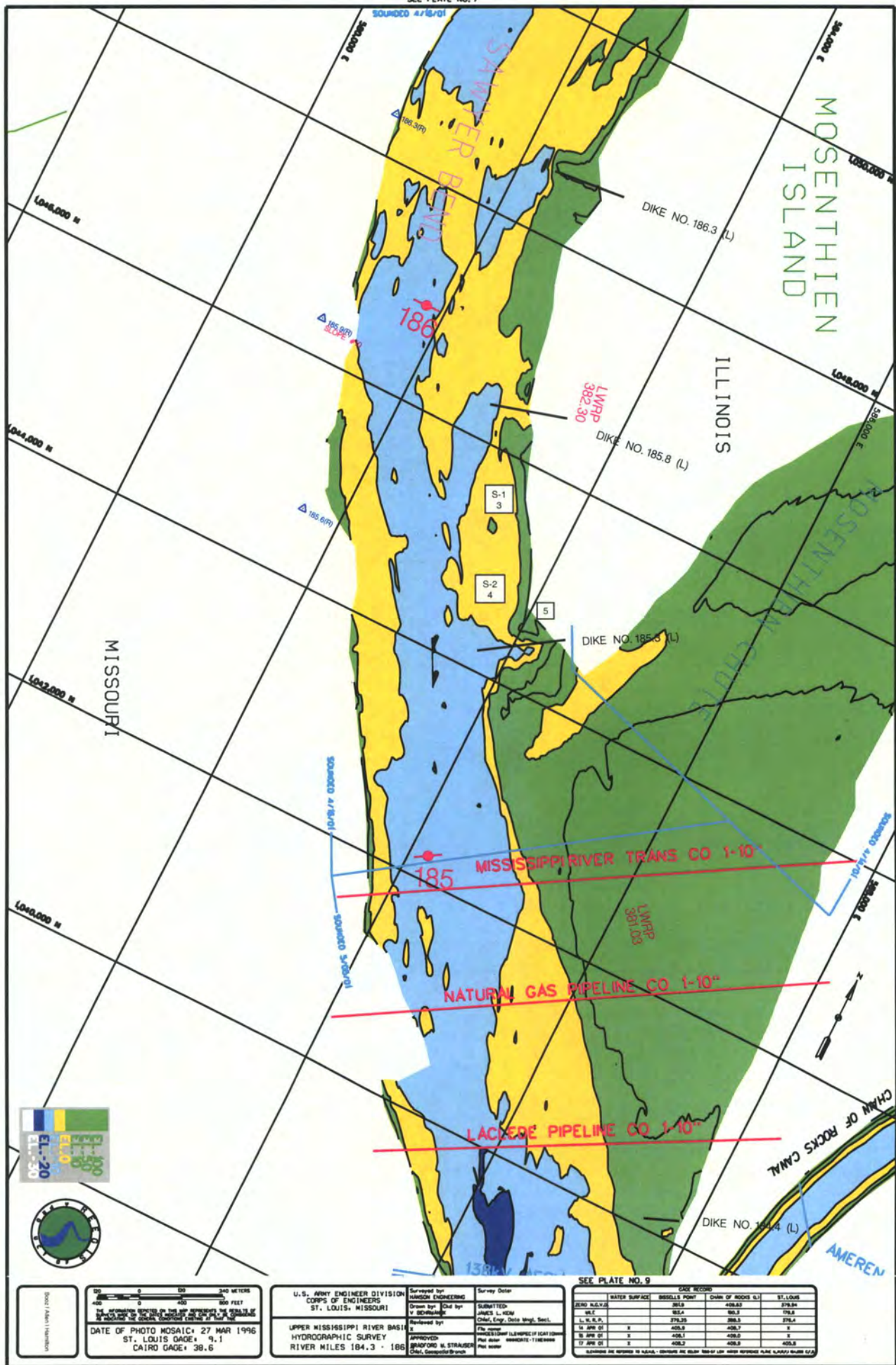
● Sample Sites

Booz | Allen | Hamilton

HYDROGRAPHIC MAPS



SEE PLATE NO. 7



DATE OF PHOTO MOSAIC: 27 MAR 1996
ST. LOUIS GAGE: 9.1
CAIRO GAGE: 38.6

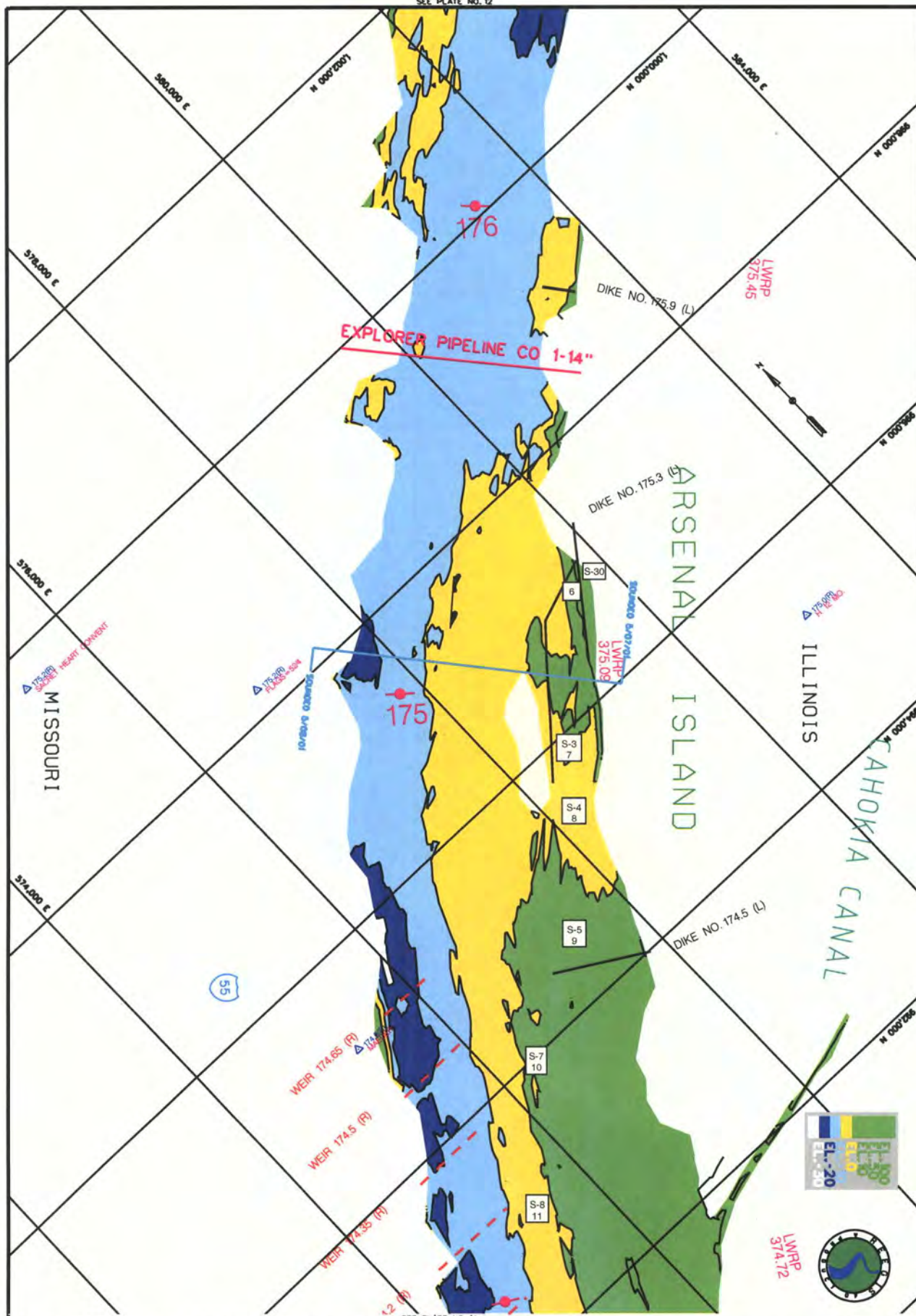
U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI
UPPER MISSISSIPPI RIVER BASIN
HYDROGRAPHIC SURVEY
RIVER MILES 184.3 - 186

Survey Data
SUBMITTED: JAMES L. KOW
CHART: CHART 1000 (1984)
APPROVED: BRADY H. STRAUSS
CHART: CHART 1000 (1984)

SEE PLATE NO. 9

WATER SURFACE	BRIDGES POINT	CHAIN OF ROCKS (L)	ST. LOUIS
20.0	20.0	20.0	20.0
21.0	21.0	21.0	21.0
22.0	22.0	22.0	22.0
23.0	23.0	23.0	23.0
24.0	24.0	24.0	24.0
25.0	25.0	25.0	25.0
26.0	26.0	26.0	26.0
27.0	27.0	27.0	27.0
28.0	28.0	28.0	28.0
29.0	29.0	29.0	29.0
30.0	30.0	30.0	30.0

SEE PLATE NO. 12



SEE PLATE NO. 14

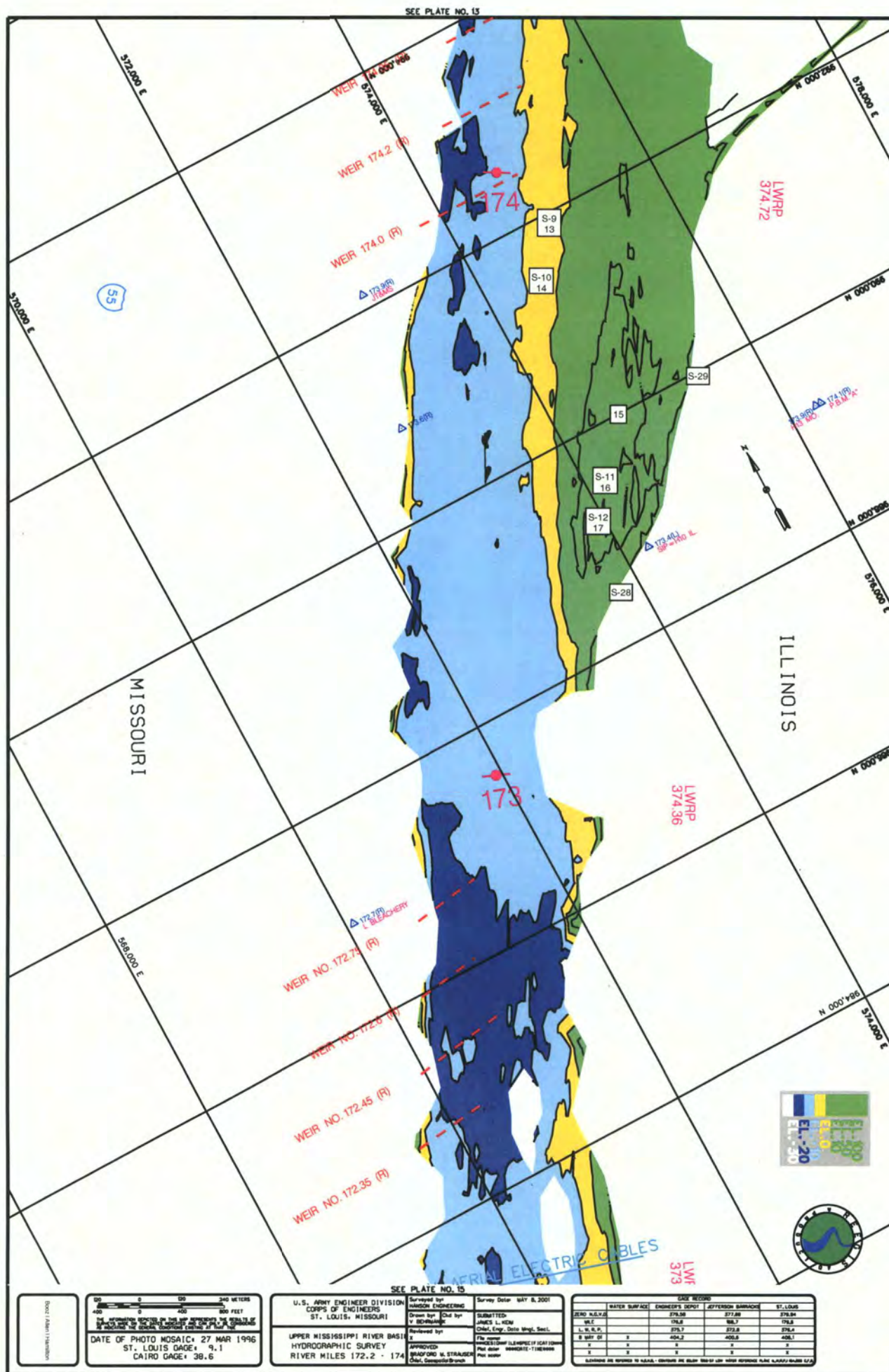
U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

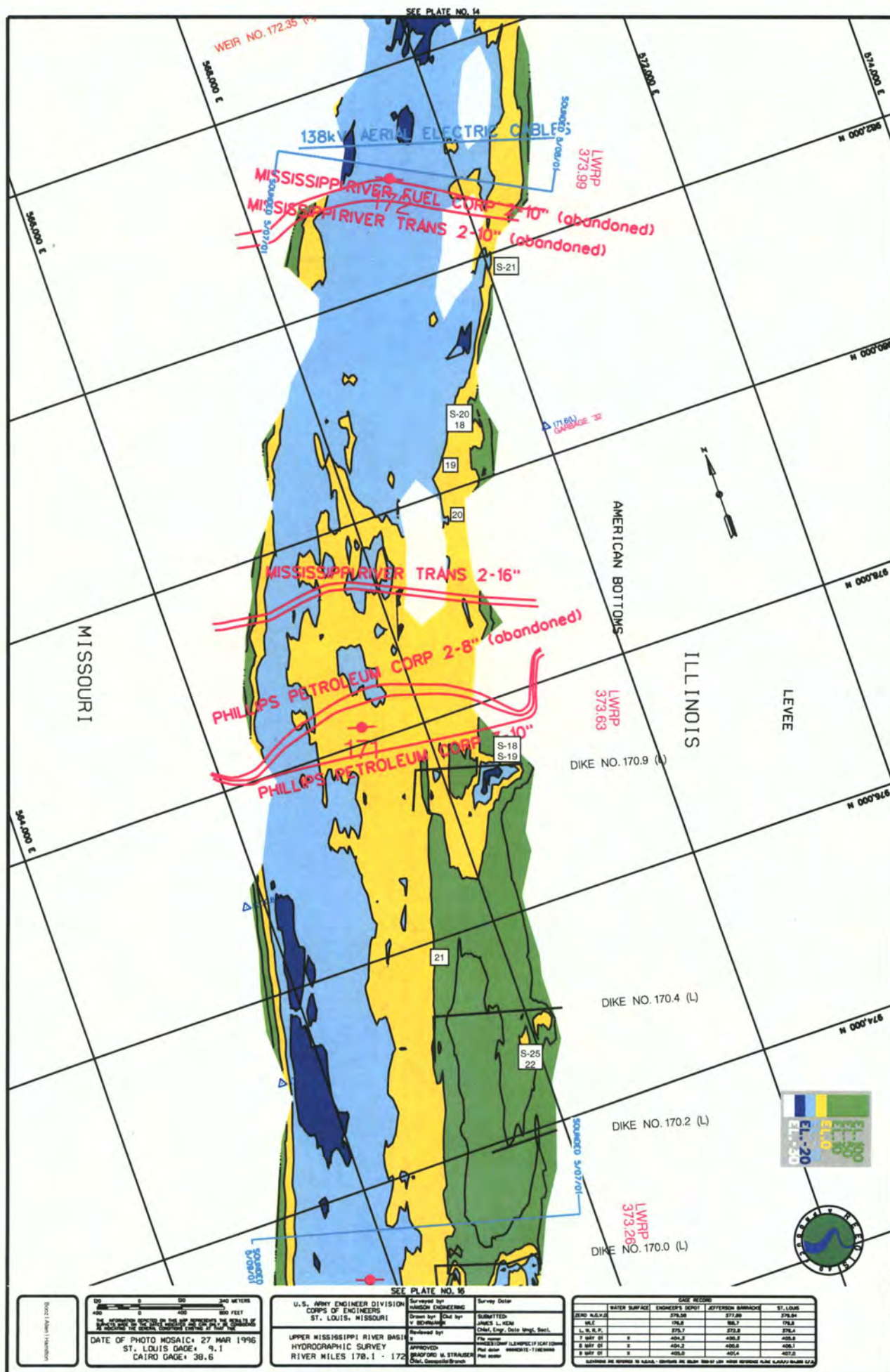
DATE OF PHOTO MOSAIC: 27 MAR 1996
ST. LOUIS GAGE: 3.1
CAIRO GAGE: 38.6

UPPER MISSISSIPPI RIVER BASIN
HYDROGRAPHIC SURVEY
RIVER MILES 174.1 - 176.5

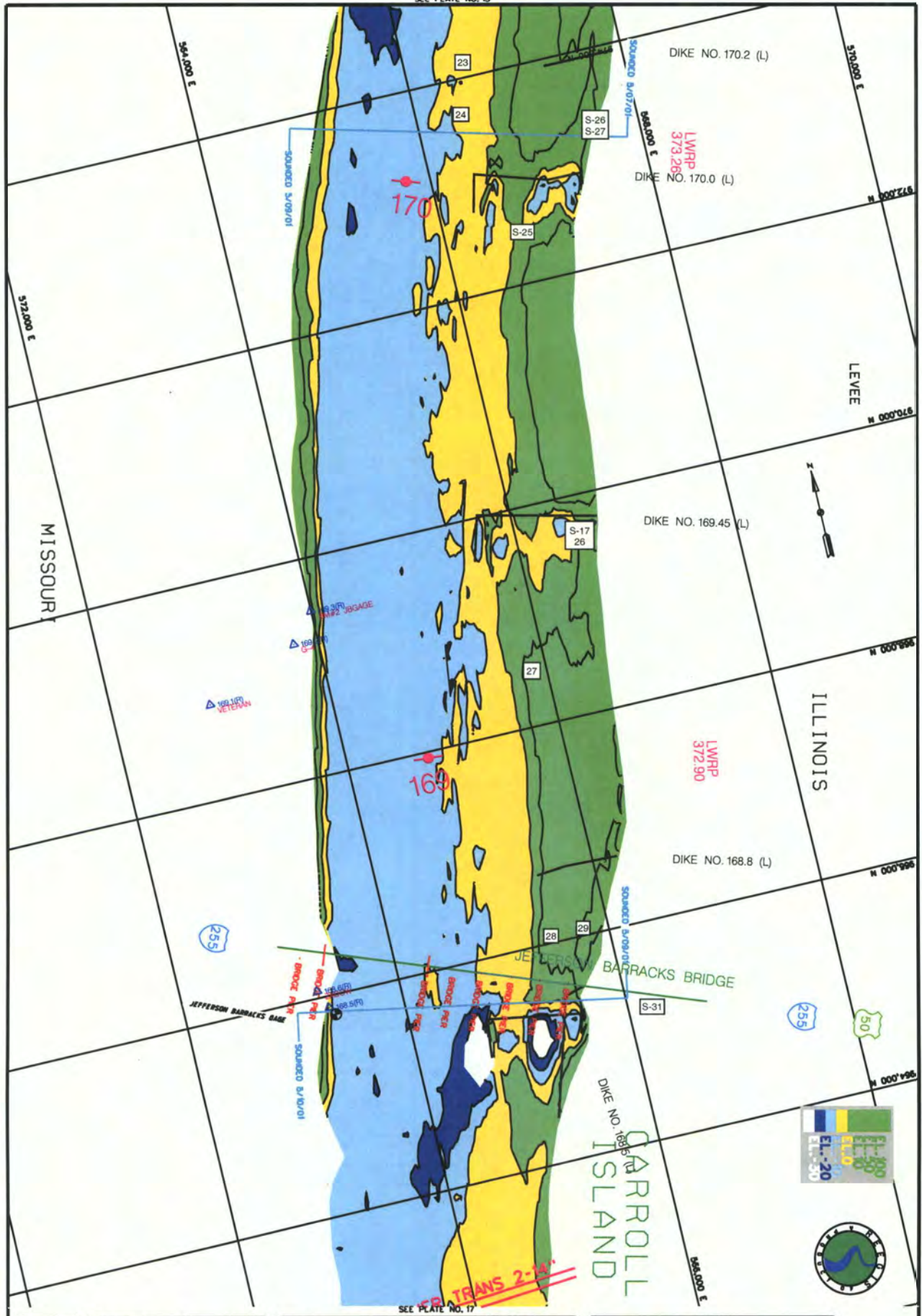
Survey Data
Submitted by: JAMES L. WILSON
Checked by: JAMES L. WILSON
Reviewed by: JAMES L. WILSON
Approved by: JAMES L. WILSON
Date: 11/11/95

DATE	WATER SURFACE	ENGINEER'S REPORT	JEFFERSON BARRAGE	ST. LOUIS
1996	274.30	274.30	274.30	274.30
1995	274.30	274.30	274.30	274.30
1994	274.30	274.30	274.30	274.30
1993	274.30	274.30	274.30	274.30
1992	274.30	274.30	274.30	274.30
1991	274.30	274.30	274.30	274.30
1990	274.30	274.30	274.30	274.30
1989	274.30	274.30	274.30	274.30
1988	274.30	274.30	274.30	274.30
1987	274.30	274.30	274.30	274.30
1986	274.30	274.30	274.30	274.30
1985	274.30	274.30	274.30	274.30
1984	274.30	274.30	274.30	274.30
1983	274.30	274.30	274.30	274.30
1982	274.30	274.30	274.30	274.30
1981	274.30	274.30	274.30	274.30
1980	274.30	274.30	274.30	274.30
1979	274.30	274.30	274.30	274.30
1978	274.30	274.30	274.30	274.30
1977	274.30	274.30	274.30	274.30
1976	274.30	274.30	274.30	274.30
1975	274.30	274.30	274.30	274.30
1974	274.30	274.30	274.30	274.30
1973	274.30	274.30	274.30	274.30
1972	274.30	274.30	274.30	274.30
1971	274.30	274.30	274.30	274.30
1970	274.30	274.30	274.30	274.30
1969	274.30	274.30	274.30	274.30
1968	274.30	274.30	274.30	274.30
1967	274.30	274.30	274.30	274.30
1966	274.30	274.30	274.30	274.30
1965	274.30	274.30	274.30	274.30
1964	274.30	274.30	274.30	274.30
1963	274.30	274.30	274.30	274.30
1962	274.30	274.30	274.30	274.30
1961	274.30	274.30	274.30	274.30
1960	274.30	274.30	274.30	274.30
1959	274.30	274.30	274.30	274.30
1958	274.30	274.30	274.30	274.30
1957	274.30	274.30	274.30	274.30
1956	274.30	274.30	274.30	274.30
1955	274.30	274.30	274.30	274.30
1954	274.30	274.30	274.30	274.30
1953	274.30	274.30	274.30	274.30
1952	274.30	274.30	274.30	274.30
1951	274.30	274.30	274.30	274.30
1950	274.30	274.30	274.30	274.30
1949	274.30	274.30	274.30	274.30
1948	274.30	274.30	274.30	274.30
1947	274.30	274.30	274.30	274.30
1946	274.30	274.30	274.30	274.30
1945	274.30	274.30	274.30	274.30
1944	274.30	274.30	274.30	274.30
1943	274.30	274.30	274.30	274.30
1942	274.30	274.30	274.30	274.30
1941	274.30	274.30	274.30	274.30
1940	274.30	274.30	274.30	274.30
1939	274.30	274.30	274.30	274.30
1938	274.30	274.30	274.30	274.30
1937	274.30	274.30	274.30	274.30
1936	274.30	274.30	274.30	274.30
1935	274.30	274.30	274.30	274.30
1934	274.30	274.30	274.30	274.30
1933	274.30	274.30	274.30	274.30
1932	274.30	274.30	274.30	274.30
1931	274.30	274.30	274.30	274.30
1930	274.30	274.30	274.30	274.30
1929	274.30	274.30	274.30	274.30
1928	274.30	274.30	274.30	274.30
1927	274.30	274.30	274.30	274.30
1926	274.30	274.30	274.30	274.30
1925	274.30	274.30	274.30	274.30
1924	274.30	274.30	274.30	274.30
1923	274.30	274.30	274.30	274.30
1922	274.30	274.30	274.30	274.30
1921	274.30	274.30	274.30	274.30
1920	274.30	274.30	274.30	274.30
1919	274.30	274.30	274.30	274.30
1918	274.30	274.30	274.30	274.30
1917	274.30	274.30	274.30	274.30
1916	274.30	274.30	274.30	274.30
1915	274.30	274.30	274.30	274.30
1914	274.30	274.30	274.30	274.30
1913	274.30	274.30	274.30	274.30
1912	274.30	274.30	274.30	274.30
1911	274.30	274.30	274.30	274.30
1910	274.30	274.30	274.30	274.30
1909	274.30	274.30	274.30	274.30
1908	274.30	274.30	274.30	274.30
1907	274.30	274.30	274.30	274.30
1906	274.30	274.30	274.30	274.30
1905	274.30	274.30	274.30	274.30
1904	274.30	274.30	274.30	274.30
1903	274.30	274.30	274.30	274.30
1902	274.30	274.30	274.30	274.30
1901	274.30	274.30	274.30	274.30
1900	274.30	274.30	274.30	274.30





SEE PLATE NO. 15



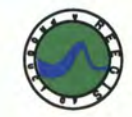
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DATE OF PHOTO MOSAIC: 2 MAR 1998
ST. LOUIS GAGE: 27.8
CAIRO GAGE: 39.9

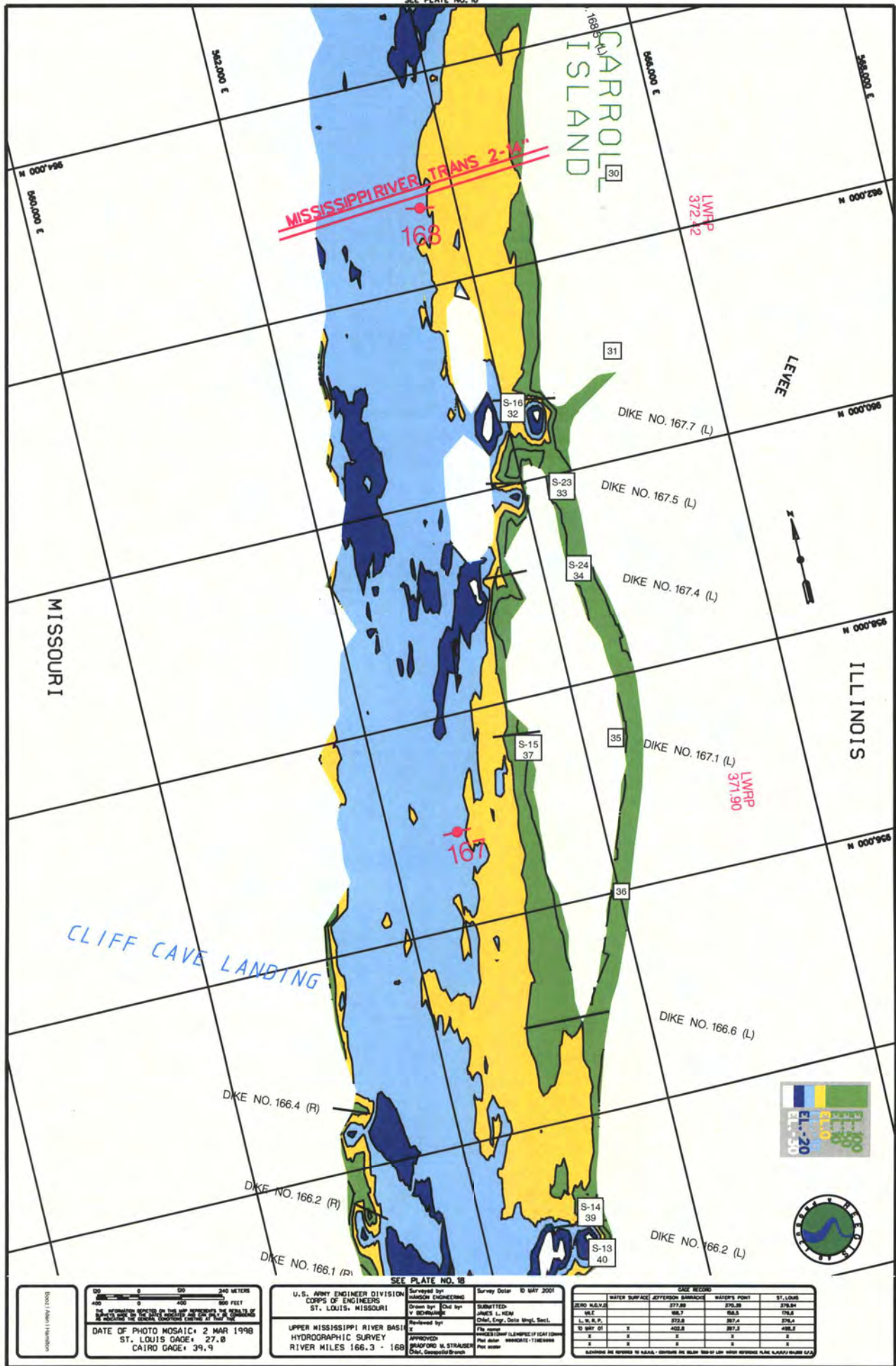
U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI
UPPER MISSISSIPPI RIVER BASIN
HYDROGRAPHIC SURVEY
RIVER MILES 168.2 - 170

Survey Data
Submitted by: JAMES L. KEN
Checked by: JAMES L. KEN
Reviewed by: JAMES L. KEN
Approved by: JAMES L. KEN
Date: 11/18/98

GAUGE RECORD				
ENGINEER	DEPOSIT	JEFFERSON	WATERS	ST. LOUIS
27.00	27.00	27.00	27.00	27.00
27.00	27.00	27.00	27.00	27.00
27.00	27.00	27.00	27.00	27.00
27.00	27.00	27.00	27.00	27.00
27.00	27.00	27.00	27.00	27.00
27.00	27.00	27.00	27.00	27.00
27.00	27.00	27.00	27.00	27.00
27.00	27.00	27.00	27.00	27.00
27.00	27.00	27.00	27.00	27.00



SEE PLATE NO. 15



MISSOURI

ILLINOIS

CLIFF CAVE LANDING

DATE OF PHOTO MOSAIC: 2 MAR 1998
ST. LOUIS GAGE: 27.8
CAIRO GAGE: 39.9

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI
UPPER MISSISSIPPI RIVER BASIN
HYDROGRAPHIC SURVEY
RIVER MILES 166.3 - 168

GAGE RECORD			
WATER SURFACE	ADDITIONAL SURFACE	WATER'S POINT	ST. LOUIS
277.89	277.89	278.84	278.84
278.7	278.7	279.8	279.8
279.8	279.8	280.8	280.8
280.8	280.8	281.8	281.8
281.8	281.8	282.8	282.8
282.8	282.8	283.8	283.8
283.8	283.8	284.8	284.8
284.8	284.8	285.8	285.8
285.8	285.8	286.8	286.8
286.8	286.8	287.8	287.8
287.8	287.8	288.8	288.8
288.8	288.8	289.8	289.8
289.8	289.8	290.8	290.8
290.8	290.8	291.8	291.8
291.8	291.8	292.8	292.8
292.8	292.8	293.8	293.8
293.8	293.8	294.8	294.8
294.8	294.8	295.8	295.8
295.8	295.8	296.8	296.8
296.8	296.8	297.8	297.8
297.8	297.8	298.8	298.8
298.8	298.8	299.8	299.8
299.8	299.8	300.8	300.8

APPENDIX B: SEDIMENT BOREHOLE LOGS

GEOLOGIC BOREHOLE LOG

Page 1 of 1

Borehole (Location) ID: S-1

Site Location Mississippi River					Drill Rig Type Pontoon Boat					Drill Method Vibracore				
Location Description Downstream of Dike No. 185.8(L) 38D 42.284M / 90D 12.437M														
Establishing Company Booz Allen Hamilton					Geologist Cedric Cascio					Drilling Company AScl				
Drilling Foreman Elliott Smith					Ground Surface Elevation					Datum				
Sampling Device CAB Tube w/catcher					Borehole Diameter (inches) 4					Total Depth (Feet) 7				
Date/Time Drilling Started 10/12/05 1045										Date/Time Total Depth Reached 10/12/05 1047				
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time						
	% Recov	Sample Depth	Blow Counts	PID										
1					13.5	OL-CL	Dark grayish brown (10YR4/2) and dark gray (10YR4/1) silty clay and organic material							
2					4.6	SW	Very dark gray (10YR3/1) well-graded fine-grain sand; iron staining @ 1.3'							
3					0	ML	Dark gray (10YR4/1) silt; trace very fine-grain sand; occasional sand seams							
4	NA		NA		0									
5					0	SP	Dark gray (10YR4/1) poorly-graded sand; fine-grained to coarse-grained with depth							
6					0									
7					0				Equipment refusal at 7'					
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GEOLOGIC BOREHOLE LOG

Page 1 of 1

Borehole (Location) ID: S-2

Site Location Mississippi River				Drill Rig Type Pontoon Boat				Drill Method Vibracore			
Location Description Upstream of Dike No. 185.3(L) 38D 42.154M / 90D 12.363M											
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio				Drilling Company AScl			
Drilling Foreman Elliott Smith				Ground Surface Elevation				Datum			
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4				Total Depth (Feet) 5.5			
Date/Time Drilling Started 10/12/05 1120						Date/Time Total Depth Reached 10/12/05 1123					
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time			
	% Recov	Sample Depth	Blow Counts	PID							
1	NA		NA	0		OL-CL	Dark grayish brown (10YR4/2) to very dark gray (10YR3/1) silty clay and organic material; trace fine-grained sand; compacted leaves from 3.5 to 4'				
2				0.4							
3				0							
4				0							
5				0							
6				0		SM	Very dark gray (10YR3/1) silty sand; compacted leaves @ 5.5'	Equipment refusal at 5.5'			
7											
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GEOLOGIC BOREHOLE LOG

Page 1 of 1

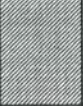
Borehole (Location) ID: S-3

Site Location Mississippi River					Drill Rig Type Pontoon Boat		Drill Method Vibracore	
Location Description East of Dike No. 175.3(L) 38D 34.128M / 90D 13.518M								
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio			Drilling Company AScl	
Drilling Foreman Elliott Smith				Ground Surface Elevation			Datum	
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4			Total Depth (Feet) 2.75	
Date/Time Drilling Started 10/12/05 1640					Date/Time Total Depth Reached 10/12/05 1645			
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1				0.5		SW	Olive brown (2.5YR4/3) well-graded sand (very fine grain and fine grain)	
2	NA		NA	0.5		CL	Very dark gray (10YR3/1) silty clay	
3				1		SW	Dark grayish brown (2.5YR4/2) well-graded sand (fine grain and medium grain)	Equipment refusal at 2.75'
4								
5								
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GEOLOGIC BOREHOLE LOG

Page 1 of 1

Borehole (Location) ID: S-4 (S-6)

Site Location Mississippi River				Drill Rig Type Pontoon Boat				Drill Method Vibracore			
Location Description Downstream of Dike No. 175.3(L) 38D 34.065M / 90D 13.557M											
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio				Drilling Company AScl			
Drilling Foreman Elliott Smith				Ground Surface Elevation				Datum			
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4				Total Depth (Feet) 3.5			
Date/Time Drilling Started 10/12/05 1612						Date/Time Total Depth Reached 10/12/05 1615					
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time			
	% Recov	Sample Depth	Blow Counts	PID							
1				0		CL	Very dark gray (10YR3/1) silty clay; intermittent very dark grayish brown (10YR3/2) well-graded very fine grained and fine grained sand seams (0.25") at 1' and 1.5'	Equipment refusal at 3.5"			
2	NA		NA	0							
3				0							
4				0							
5											
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Sediment sample S-6 was collected at this location to serve as a duplicate sample to S-4

GEOLOGIC BOREHOLE LOG

Page 1 of 1

Borehole (Location) ID: S-5

Site Location Mississippi River				Drill Rig Type Pontoon Boat		Drill Method Vibracore		
Location Description Upstream of Dike No. 174.5(L) 38D 33.910M / 90D 13.665M								
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio		Drilling Company AScl		
Drilling Foreman Elliott Smith				Ground Surface Elevation		Datum		
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4		Total Depth (Feet) 4.5		
Date/Time Drilling Started 10/12/05 1540				Date/Time Total Depth Reached 10/12/05 1545				
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1				0				
2				0		CL	Very dark gray (10YR3/1) silty clay	
3	NA		NA	0				
4				0		SP	Very dark grayish brown (10YR3/2) poorly-graded medium-grain sand	
5				0				Equipment refusal at 4.5"
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GEOLOGIC BOREHOLE LOG

Page 1 of 1

Borehole (Location) ID: S-7

Site Location Mississippi River				Drill Rig Type Pontoon Boat				Drill Method Vibracore			
Location Description Sand bar on east side of river, between RM174 and RM175 38D 33.715M / 90D 13.975M											
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio				Drilling Company AScl			
Drilling Foreman Elliott Smith				Ground Surface Elevation				Datum			
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4				Total Depth (Feet) 4			
Date/Time Drilling Started 10/13/05 0840						Date/Time Total Depth Reached 10/13/05 0843					
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time			
	% Recov	Sample Depth	Blow Counts	PID							
1				0							
2	NA		NA	0		SW	Pale brown (10YR6/3) grading to gray (10YR5/1) at 3.5'; well-graded sand (fine-grain and medium grain), generally coarsening with depth; some gravel (0.5") - rounded and subrounded				
3				0							
4				0				Equipment refusal at 4"			
5											
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GEOLOGIC BOREHOLE LOG

Page 1 of 1

Borehole (Location) ID: S-8

Site Location Mississippi River				Drill Rig Type Pontoon Boat				Drill Method Vibracore			
Location Description Sand bar on east side of river, between RM174 and RM175 38D 33.517M / 90D 14.146M											
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio				Drilling Company AScl			
Drilling Foreman Elliott Smith				Ground Surface Elevation				Datum			
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4				Total Depth (Feet) 2.5			
Date/Time Drilling Started 10/13/05 0945						Date/Time Total Depth Reached 10/13/05 1000					
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time			
	% Recov	Sample Depth	Blow Counts	PID							
1				0							
2	NA		NA	0		SW	Pale brown (10YR6/3) well-graded sand (fine- to coarse-grain) and gravel (1" to 2.5") (angular to rounded)				
3				0				Equipment refusal at 2.5'			
4											
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GEOLOGIC BOREHOLE LOG

Page 1 of 1

Borehole (Location) ID: S-9

Site Location Mississippi River				Drill Rig Type Pontoon Boat		Drill Method Vibracore		
Location Description Sand bar on east side of river, between RM173 and RM174 38D 33.388M / 90D 14.252M								
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio		Drilling Company AScl		
Drilling Foreman Elliott Smith				Ground Surface Elevation		Datum		
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4		Total Depth (Feet) 1.5		
Date/Time Drilling Started 10/13/05 1230				Date/Time Total Depth Reached 10/13/05 1240				
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1	NA		NA	0		SW	Pale brown (10YR6/3) well-graded sand (fine- to coarse-grain) and gravel (1") (angular to rounded)	Equipment refusal at 1.5'
2				0				
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GEOLOGIC BOREHOLE LOG

Page 1 of 1

Borehole (Location) ID: S-10

Site Location Mississippi River				Drill Rig Type Pontoon Boat				Drill Method Vibracore			
Location Description Sand bar on east side of river, between RM173 and RM174 38D 33.261M / 90D 14.354M											
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio				Drilling Company AScl			
Drilling Foreman Elliott Smith				Ground Surface Elevation				Datum			
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4				Total Depth (Feet) 2.25			
Date/Time Drilling Started 10/13/05 1155						Date/Time Total Depth Reached 10/13/05 1200					
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time			
	% Recov	Sample Depth	Blow Counts	PID							
1				0							
2	NA		NA	0		SW	Pale brown (10YR6/3) well-graded sand (fine- to coarse-grain) and subrounded gravel (1"); generally coarser in top 1'				
3				0				Equipment refusal at 2.25'			
4											
5											
6											
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GEOLOGIC BOREHOLE LOG

Page 1 of 1

Borehole (Location) ID: S-11

Site Location Mississippi River				Drill Rig Type Pontoon Boat		Drill Method Vibracore		
Location Description Sand bar on east side of river, between RM173 and RM174 38D 33.044M / 90D 14.467M								
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio		Drilling Company AScl		
Drilling Foreman Elliott Smith				Ground Surface Elevation		Datum		
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4		Total Depth (Feet) 1.5		
Date/Time Drilling Started 10/13/05 1030				Date/Time Total Depth Reached 10/13/05 1035				
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1	NA		NA	0		SW	Pale brown (10YR6/3) well-graded sand (fine- to coarse-grain) and subrounded gravel (0.75")	
2				0				Equipment refusal at 1.5'
3								
4								
5								
6								
7								
8								
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GEOLOGIC BOREHOLE LOG

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Borehole (Location) ID: S-12

Site Location Mississippi River				Drill Rig Type Pontoon Boat				Drill Method Vibracore			
Location Description Sand bar on east side of river, between RM173 and RM174 38D 32.971M / 90D 14.465M											
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio				Drilling Company AScl			
Drilling Foreman Elliott Smith				Ground Surface Elevation				Datum			
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4				Total Depth (Feet) 1.5			
Date/Time Drilling Started 10/13/05 1120						Date/Time Total Depth Reached 10/13/05 1123					
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time			
	% Recov	Sample Depth	Blow Counts	PID							
1	NA		NA	0		SW	Pale brown (10YR6/3) well-graded sand (fine- to coarse-grain) and subrounded gravel (0.5"); coal fragments (3/8") at 1'; driftwood fragments throughout				
2				0				Equipment refusal at 1.5'			
3											
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Borehole (Location) ID: S-13

Site Location Mississippi River				Drill Rig Type Pontoon Boat				Drill Method Vibracore			
Location Description Downstream of Dike No. 166.2(L) 38D 27.009M / 90D 16.808M											
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio				Drilling Company AScl			
Drilling Foreman Elliott Smith				Ground Surface Elevation				Datum			
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4				Total Depth (Feet) 7.5			
Date/Time Drilling Started 10/14/05 1015						Date/Time Total Depth Reached 10/14/05 1020					
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time			
	% Recov	Sample Depth	Blow Counts	PID							
1	NA		NA	0		OL	Very dark gray (10YR3/1) organic silt and silty clay; trace sand; gelatinous; fine-grain sand seams (1") at 3' and 37"				
2				0							
3				0							
4				0							
5				0							
6				0							
7				0							
8				0							
9					SW	Grayish brown (10YR5/2) well-graded sand (fine- to coarse-grain) and gravel (1/8")	Equipment refusal at 7.5'				
10					OL	Very dark gray (10YR3/1) organic silt and silty clay					
11							Sample S-13 served as MS/MSD				
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GEOLOGIC BOREHOLE LOG

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Borehole (Location) ID: S-14

Site Location Mississippi River				Drill Rig Type Pontoon Boat		Drill Method Vibracore		
Location Description Upstream of Dike No. 166.2(L) 38D 27.079M / 90D 16.801M								
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio		Drilling Company AScl		
Drilling Foreman Elliott Smith				Ground Surface Elevation		Datum		
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4		Total Depth (Feet) 3		
Date/Time Drilling Started 10/14/05 1050				Date/Time Total Depth Reached 10/14/05 1055				
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1				0				
2	NA		NA	0		OL-SW	Very dark gray (10YR3/1) organic silt and silty clay (top 1") overlying pale brown (10YR6/3) well-graded sand (fine- and medium-grain) and gravel (1/8")	
3				0				Equipment refusal at 3'
4								
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GEOLOGIC BOREHOLE LOG

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Borehole (Location) ID: S-15

Site Location Mississippi River				Drill Rig Type Pontoon Boat				Drill Method Vibracore			
Location Description Downstream of Dike No. 167.1(L) 38D 27.809M / 90D 16.725M											
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio				Drilling Company AScl			
Drilling Foreman Elliott Smith				Ground Surface Elevation				Datum			
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4				Total Depth (Feet) 2			
Date/Time Drilling Started 10/14/05 1145						Date/Time Total Depth Reached 10/14/05 1150					
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time			
	% Recov	Sample Depth	Blow Counts	PID							
1	NA		NA	0		ML-SW	Very dark gray (10YR3/1) silt and clayey very fine-grain sand (top 6"), overlying very dark gray (10YR3/1) well-graded sand (fine- to coarse-grain) and gravel; gravel primarily in 3" interval at 1.25'	Equipment refusal at 2'			
2				0							
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GEOLOGIC BOREHOLE LOG

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Borehole (Location) ID: S-16

Site Location Mississippi River				Drill Rig Type Pontoon Boat				Drill Method Vibracore			
Location Description Between Dike No. 167.5(L) and RM168 38D 28.287M / 90D 16.505M											
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio				Drilling Company AScl			
Drilling Foreman Elliott Smith				Ground Surface Elevation				Datum			
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4				Total Depth (Feet) 5			
Date/Time Drilling Started 10/14/05 1245						Date/Time Total Depth Reached 10/14/05 1250					
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time			
	% Recov	Sample Depth	Blow Counts	PID							
1	NA		NA	0		SM	Very dark gray (10YR3/1) silty sand (very fine grain); trace clay	Equipment refusal at 5'			
2				0		SP	Gray (10YR5/1) poorly-graded fine-grain sand				
3				0							
4				0		ML-SW	Very dark gray (10YR3/1) sandy silt with trace clay (sand content increases with depth); becoming brown (10YR5/3) well-graded sand (very fine grain to medium grain) at 4'8"				
5				0							
6											
7											
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GEOLOGIC BOREHOLE LOG

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Borehole (Location) ID: S-17

Site Location Mississippi River					Drill Rig Type Pontoon Boat		Drill Method Vibracore	
Location Description Downstream of Dike No. 169.45(L) 38D 29.794M / 90D 16.057M								
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio		Drilling Company AScl		
Drilling Foreman Elliott Smith				Ground Surface Elevation		Datum		
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4		Total Depth (Feet) 5.5		
Date/Time Drilling Started 10/14/05 1350					Date/Time Total Depth Reached 10/14/05 1355			
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1				26.5	[Pattern]	OL	Very dark gray (10YR3/1) organic silt with clay; trace sand; roots and leaf matter throughout; intermittent fine-grain sand lenses (0.5") throughout top 3'; medium-grain sand lenses (3") at 3' and 4.8'	
2				48.2				
3	NA		NA	84.9				
4				119				
5				185				
6				38.6				Equipment refusal at 5.5'
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GEOLOGIC BOREHOLE LOG

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Borehole (Location) ID: S-18 (S-19)

Site Location Mississippi River				Drill Rig Type Pontoon Boat		Drill Method Vibracore		
Location Description Cove, upstream of Dike No. 170.9(L) 38D 31.0814M / 90D 15.606M								
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio		Drilling Company AScl		
Drilling Foreman Elliott Smith				Ground Surface Elevation		Datum		
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4		Total Depth (Feet) 9		
Date/Time Drilling Started 10/15/05 0910				Date/Time Total Depth Reached 10/15/05 0915				
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1				1.6		OL	Very dark gray (10YR3/1) organic silt with clay; trace sand (vfg); decaying roots and leaf matter throughout; poorly-graded medium-grain sand lenses (4") at 3.75' and 7.5'	
2				2.1				
3				8.1				
4				10.2				
5	NA		NA	58.7				
6				359				
7				138				
8				27.2				
9				38.6				
10								
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12								Sediment sample S-19 was collected at this location to serve as a duplicate sample to S-18
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GEOLOGIC BOREHOLE LOG

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Borehole (Location) ID: S-20

Site Location Mississippi River					Drill Rig Type Pontoon Boat		Drill Method Vibracore	
Location Description Between RM171 and RM172 38D 31.347M / 90D 15.517M								
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio			Drilling Company AScl	
Drilling Foreman Elliott Smith				Ground Surface Elevation			Datum	
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4			Total Depth (Feet) 5.5	
Date/Time Drilling Started 10/15/05 0945					Date/Time Total Depth Reached 10/15/05 0950			
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1	NA		NA	14.1		SM-ML	Brown (10YR5/3) silty fine-grain sand, overlying very dark gray (10YR3/2) silt with very fine grain sand; mat of leaves (2") at 1'; gray (10YR5/1) fine- and medium-grain sand lenses at 13" and 20"	Equipment refusal at 5.5'
2				11.5		ML		
3				2.1				
4				2.7				
5				0		SW		
6				0				
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GEOLOGIC BOREHOLE LOG

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Borehole (Location) ID: S-21

Site Location Mississippi River					Drill Rig Type Pontoon Boat		Drill Method Vibracore	
Location Description Between RM171 and RM172 38D 31.645M / 90D 15.400M								
Establishing Company Booz Allen Hamilton					Geologist Cedric Cascio		Drilling Company AScl	
Drilling Foreman Elliott Smith					Ground Surface Elevation		Datum	
Sampling Device CAB Tube w/catcher					Borehole Diameter (inches) 4		Total Depth (Feet) 5.5	
Date/Time Drilling Started 10/15/05 1020					Date/Time Total Depth Reached 10/15/05 1025			
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1	NA		NA	33.1		OL-SM	Dark grayish brown (10YR4/2) organic silt (gelatinous) with trace sand (0.5'), overlying dark brown (10YR3/3) sand-silt mixture with red (10R4/8) and black (10YR2/1) staining	
2								
3								
4								
5								
6				177		ML	Very dark gray (10YR3/1) silt; trace clay and sand; poorly-graded sand lenses (3") at 2.5' and 3'; occasional black (10YR2/1) streaks; mat of leaves (1/4") at 3.25'	
7								
8								
9								
10								
11				25.6		SW	Dark gray (10YR4/1) well-graded sand with gravel (3"), generally coarsening with depth; clayey silt lens (0.5") at 4.5'	Equipment refusal at 5.5'
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GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: S-22

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Site Location Mississippi River					Drill Rig Type Pontoon Boat		Drill Method Vibracore	
Location Description Between Dike Nos. 189.3(L) and 189.6(L) 38D 44.7515M / 90D 10.776M								
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio			Drilling Company AScl	
Drilling Foreman Elliott Smith				Ground Surface Elevation			Datum	
Sampling Device CAB Tube w/catcher				Borehole Diameter (inches) 4			Total Depth (Feet) 5.5	
Date/Time Drilling Started 10/15/05 1615					Date/Time Total Depth Reached 10/15/05 1620			
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1	NA			75.6		OL	Dark grayish brown (10YR4/2) to very dark grayish brown (10YR3/2) gelatinous organic silt with clay and trace sand; brown (10YR5/3) gravelly sand lens at 8"	Equipment refusal at 5.5'
2				229		ML	Dark gray (10YR3/1) well-graded (fine- and medium-grain) sand (3"), overlying very dark gray (10YR3/1) silt with trace very fine grain sand; fine-grain sand lenses (1") at 21" and 28"	
3				100				
4				10.2		SP	Grayish brown (10YR5/2) poorly-graded sand with gravel, coarsening with depth	
5				10.1				
6				10.1		ML	Very dark grayish brown (10YR3/2) silt	
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Borehole (Location) ID: S-23

Site Location Mississippi River				Drill Rig Type Geoprobe 54DT		Drill Method Direct Push		
Location Description Jefferson Chute, near Dike No. 167.5(L) 38D 27.990M / 90D 16.492M								
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio		Drilling Company PSA Environmental		
Drilling Foreman				Ground Surface Elevation		Datum		
Sampling Device Macrocore with PVC liner				Borehole Diameter (inches) 2		Total Depth (Feet) 20		
Date/Time Drilling Started 10/17/05 1535				Date/Time Total Depth Reached 10/17/05 1610				
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1				NA		SP	Brown (10YR4/3) poorly-graded sand, coarsening with depth; gravel at 2'	
2	100%			NA				
3				NA				
4				NA				
5				NA				
6	100%			NA		SW	Brown (10YR5/3) well-graded sand (very fine- and fine grain)	
7				NA				
8				NA				
9				NA				
10	100%			NA				
11				NA				
12				NA				
13				NA				
14	100%			NA				
15				NA			Yellowish brown (10YR5/6) well-graded sand (fine- and medium-grain); very dark grayish brown (10YR/3/2) clay lens (1/2") at 10.75'	
16				NA				
17				NA				
18	100%			NA				
19				NA				PID unit not operating properly
20				NA			Gray (10YR5/1) silty sand with gravel	
21								
22								
23								
24								
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
Borehole (Location) ID: S-24

Site Location Mississippi River					Drill Rig Type Geoprobe 54DT		Drill Method Direct Push	
Location Description Jefferson Chute, between Dike Nos. 167.1(L) and 167.5(L) 38D 27.882M / 90D 16.463M								
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio			Drilling Company PSA Environmental	
Drilling Foreman				Ground Surface Elevation			Datum	
Sampling Device Macrocore with PVC liner				Borehole Diameter (inches) 2			Total Depth (Feet) 8	
Date/Time Drilling Started 10/17/05 1700					Date/Time Total Depth Reached 10/17/05 1710			
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1	100%		NA	NA		ML	Dark yellowish brown (10YR4/4) to dark brown (10YR3/3) clayey silt; trace very fine grain sand; moist to wet	PID unit not operating properly
2				NA				
3				NA				
4				NA				
5	100%		NA		SP	Dark yellowish brown (10YR3/3) poorly-graded fine-grained sand; saturated		
6			NA					
7			NA					
8			NA					
9								
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12								
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Borehole (Location) ID: S-25

Site Location Mississippi River				Drill Rig Type Geoprobe 54DT		Drill Method Direct Push		
Location Description Downstream of Dike No. 170.4(L) 38D 30.597M / 90D 15.764M								
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio		Drilling Company PSA Environmental		
Drilling Foreman				Ground Surface Elevation		Datum		
Sampling Device Macrocore with PVC liner				Borehole Diameter (inches) 2		Total Depth (Feet) 20		
Date/Time Drilling Started 10/18/05 0815				Date/Time Total Depth Reached 10/18/05 0850				
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1				NA		ML-SM	Dark brown (10YR3/3) clayey silt (moist) (6"), overlying dark gray (10YR4/1) silty sand; trace clay; wet	
2	100%			NA				
3				NA				
4				NA				
5				NA			Brown (10YR5/3) well-graded sand (fine- and medium-grain); saturated	
6	100%			NA				
7				NA				
8				NA				
9				NA				
10	100%			NA				
11				NA				
12				NA				
13				NA			Very dark gray (10YR3/1) well-graded sand (fine- to coarse-grain), generally coarsening with depth; saturated	
14	100%			NA				
15				NA				
16				NA				
17				NA				
18	100%			NA				
19				NA				
20				NA				
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Borehole (Location) ID: S-26 (S-27)

Site Location Mississippi River		Drill Rig Type Geoprobe 54DT		Drill Method Direct Push				
Location Description Between Dike Nos. 170.0(L) and 170.2(L) 38D 30.354M / 90D 15.861M								
Establishing Company Booz Allen Hamilton		Geologist Cedric Cascio		Drilling Company PSA Environmental				
Drilling Foreman		Ground Surface Elevation		Datum				
Sampling Device Macrocore with PVC liner		Borehole Diameter (inches) 2		Total Depth (Feet) 8				
Date/Time Drilling Started 10/18/05 1015			Date/Time Total Depth Reached 10/18/05 1020					
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1	100%		NA	NA		SM-CL	Brown (10YR5/3) silty sand (3"), overlying very dark gray (10YR3/1) silty clay; trace very fine grain sand; silt content increases with depth; very moist	PID unit not operating properly
2				NA				
3				NA				
4				NA				
5	100%		NA	NA	SC	Very dark gray (10YR3/1) clayey sand; trace silt; saturated		
6				NA				
7				NA				
8				NA				
9								Sample S-27 was collected at this location to serve as a duplicate sample to S-26
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GEOLOGIC BOREHOLE LOG

Page 1 of 1


Borehole (Location) ID: S-28

Site Location Mississippi River				Drill Rig Type Geoprobe 54DT				Drill Method Direct Push			
Location Description Between RM173 and RM174 38D 33.048M / 90D 14.295M											
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio				Drilling Company PSA Environmental			
Drilling Foreman				Ground Surface Elevation				Datum			
Sampling Device Macrocore with PVC liner				Borehole Diameter (inches) 2				Total Depth (Feet) 8			
Date/Time Drilling Started 10/18/05 1440						Date/Time Total Depth Reached 10/18/05 1450					
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time			
	% Recov	Sample Depth	Blow Counts	PID							
1				NA		SM-ML	Brown (10YR4/3) silty sand (6"), overlying very dark grayish brown (10YR3/2) to very dark gray (10YR3/1) sandy silt; moist to wet	PID unit not operating properly			
2	100%			NA							
3				NA							
4				NA							
5			NA	NA	ML-SM	Very dark gray (10YR3/1) silt; trace clay and very fine grain sand; moist; medium stiff; sand content increases with depth; saturated silty sand 7.5-8'					
6	100%			NA							
7				NA							
8				NA							
9								Sample S-28 served as MS/MSD			
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GEOLOGIC BOREHOLE LOG

Page 1 of 1

Borehole (Location) ID: S-29

Site Location Mississippi River				Drill Rig Type Geoprobe 54DT				Drill Method Direct Push			
Location Description Floodplain (farmed land) between RM173 and RM174 38D 33.214M / 90D 14.085M											
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio				Drilling Company PSA Environmental			
Drilling Foreman				Ground Surface Elevation				Datum			
Sampling Device Macrocore with PVC liner				Borehole Diameter (inches) 2				Total Depth (Feet) 4			
Date/Time Drilling Started 10/18/05 1545						Date/Time Total Depth Reached 10/18/05 1550					
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time			
	% Recov	Sample Depth	Blow Counts	PID							
1	100%		NA	NA		SM	Dark brown (10YR3/3) silty sand; loose; damp	PID unit not operating properly			
2				NA							
3				NA		SP	Light brownish gray (10YR6/2) poorly-graded fine-grain sand; dry; loose				
4				NA		ML-SP	Dark brown (10YR3/3) sandy silt; medium stiff; wet (6") - overlying pale brown (10YR6/3) poorly-graded fine-grain sand; dry; loose				
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Sample S-29 collected as a composite
from 1-2' and 3-3.5'

GEOLOGIC BOREHOLE LOG

Page 1 of 1

Borehole (Location) ID: S-30

Site Location Mississippi River					Drill Rig Type Geoprobe 54DT					Drill Method Direct Push				
Location Description Floodplain (conservation land) east of Dike No. 175.3(L) 38D 34.290M / 90D 13.214M														
Establishing Company Booz Allen Hamilton					Geologist Cedric Cascio					Drilling Company PSA Environmental				
Drilling Foreman					Ground Surface Elevation					Datum				
Sampling Device Macrocore with PVC liner					Borehole Diameter (inches) 2					Total Depth (Feet) 12				
Date/Time Drilling Started 10/19/05 0845										Date/Time Total Depth Reached 10/19/05 0855				
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time						
	% Recov	Sample Depth	Blow Counts	PID										
1				NA		SM	Pale brown (10YR6/3) silty sand; loose; dry							
2	100%			NA										
3				NA										
4				NA										
5				NA	ML	Brown (10YR4/3) clayey silt; trace sand; moist								
6	100%		NA	NA			Brown (10YR4/3) silt; trace clay; damp							
7			NA	NA										
8				NA	SM	Grayish brown (10YR5/2) silty sand; loose; moist								
9				NA										
10	100%			NA										
11				NA	ML	Brown (10YR4/3) clayey silt; trace sand; wet								
12				NA	SP	Grayish brown (10YR5/2) poorly-graded fine-grain sand; trace silt; loose; dry	PID unit not operating properly							
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GEOLOGIC BOREHOLE LOG


Borehole (Location) ID: S-31

Page 1 of 1

Site Location Mississippi River					Drill Rig Type Geoprobe 54DT		Drill Method Direct Push	
Location Description Beneath Jefferson Barracks Bridge between spans, near 3rd set of bents from east 38D 29.075M / 90D 116.110M								
Establishing Company Booz Allen Hamilton				Geologist Cedric Cascio			Drilling Company PSA Environmental	
Drilling Foreman				Ground Surface Elevation			Datum	
Sampling Device Macrocore with PVC liner				Borehole Diameter (inches) 2			Total Depth (Feet) 8	
Date/Time Drilling Started 10/19/05 1120					Date/Time Total Depth Reached 10/19/05 1125			
Depth (feet)	Sampling				Lithologic Graph	USCS	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
	% Recov	Sample Depth	Blow Counts	PID				
1	100%		NA	NA		SM	Dark brown (10YR3/3) sandy silt; moist; aggregate throughout	
2				NA				
3				NA				
4				NA				
5	100%			NA		ML	Very dark gray (10YR3/1) silt; trace very fine grain sand; wood fragments (7.5-7.75"); firm; moist	
6				NA				
7				NA				
8				NA				
9							PID unit not operating properly	
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SOLUTIA - 236

Kenneth
Bardo/R5/USEPA/US
05/01/2006 12:08 PM

To "Branchfield, Craig R" <crbran1@solutia.com>
cc
bcc Richard Murawski/R5/USEPA/US@EPA
Subject Re: Lot F 

Craig - The new owner or operator must receive written notice of the AOC. See Section III.2 of the AOC. We also must be notified in writing of any property transfers, including an assurance that any required institutional controls will be implemented and maintained. - Ken

"Branchfield, Craig R" <crbran1@solutia.com>



"Branchfield, Craig R"
<crbran1@solutia.com>
05/01/2006 11:16 AM

To
Subject Lot F

Ken,

As an FYI, I wanted to let you know that we exercised an option with Center Oil to purchase a portion of Lot F for the construction of an ethanol facility. The portion they are likely to buy is the northern 2/3 of the lot - the drum disposal area you were asking about last week is not in the area to be purchased. Regarding environmental issues, it is in the option agreement that we shall have access to the property for any and all environmental investigations we are or will be involved in, and my understanding is that the liability for existing contamination on and under the property remains with us. During the construction of the facility, should it go forward, there is a cost sharing provision for addressing any incremental costs associated with environmental contamination that may have to be specially handled.

I'll keep you in the loop as I learn more. Apparently things are progressing well and it seems very likely that this will be moving forward. If you have any questions or concerns please let me know.

Craig

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SOLUTIA - 237



Solutia Inc.

575 Maryville Centre Drive
St. Louis, Missouri 63141

P.O. Box 66760
St. Louis, Missouri 63166-6760
Tel 314-674-1000

May 12, 2006

Mr. Kenneth Bardo
U.S EPA Region V
Corrective Action Section
Enforcement Compliance Branch
77 West Jackson Boulevard DE-J9
Chicago, IL 60604-3507

Re: PCB Mobility and Migration Phase II Investigation Report
W.G Krummrich Plant

Dear Mr. Bardo,

Enclosed please find the PCB Mobility and Migration Phase II Investigation Report for the W.G. Krummrich Facility. Please note that it is out intention to install and sample the three Phase III monitoring wells during the second quarter of this year. The Phase I Investigation Report is currently being prepared and will be provided to you under separate cover.

If you have any questions or comment regarding the enclose report please call me at (314) 674-6768.

Sincerely,

A handwritten signature in black ink, appearing to read "Craig R. Branchfield".

Craig R. Branchfield
Manager, Remedial Projects

Phase II Investigation
PCB Mobility and Migration Investigation
W.G. Krummrich Facility, Sauget, Illinois

REPORT DISTRIBUTION

USEPA

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Greta Senn Same 1 CD

Background

Polychlorinated biphenyls (PCBs) are present in the unsaturated soils in the Former PCB Manufacturing Area (PMA) at the W.G. Krummrich Facility with concentrations ranging from non-detect to 22,100 mg/kg resulting from leaks and spills over more than 40 years of operation. Solutia prepared a work plan to assess the potential migration and mobility of PCBs in the unsaturated zone soils and in groundwater beneath the site (Solutia, October 21, 2005). One element of the work plan, the "Phase II Site Investigation" was designed to identify the 25 mg/kg total PCB isoconcentration line in soil. Once this line was identified, Phase III of the investigation, installation of three monitoring well clusters at the downgradient boundary of the 25 mg/kg isocon, could be implemented.

This Tech Memo presents the results of the Phase II Site Investigation (boundary delineation) and proposes locations for the three downgradient monitoring well clusters.

Soil Sampling Procedures

Soil borings were advanced at the locations shown on **Figure 1** using direct push technology (Geoprobe). Borings were completed in separate mobilizations, comprising borings BS-1 through BS-27. The initial locations, BS-1 through BS-8, identified in the work plan, were completed at the start of work. Boring locations were identified prior to drilling by measuring distances from known locations. Field immunoassay screening was performed to estimate the 25 mg/kg boundary in real time. Additional borings were added as step-outs from the locations when screening results exceeded 25 mg/kg.

The Geoprobe hydraulically drove a stainless steel, acetate-lined MacroCore sampler (2-inch diameter by 4-foot length) to the desired subsurface sample depths. Continuous soil samples were collected from the surface to the planned sampling depths. The subsurface stratigraphy was logged during drilling operations by a qualified URS Corporation (URS) field scientist in accordance with the Unified Soil Classification System (USCS) protocols and URS procedures. The field scientist noted soil attributes such as color, particle size, consistency, moisture content, structure, odor (if obvious) and organic content (if visible). Soil samples from each boring were visually evaluated for evidence of impact and screened for organic vapors in the field using a photoionization detector (PID). At the completion of each soil boring, the boreholes were backfilled with bentonite chips and asphalt patch (where appropriate). Soil boring logs are included in **Appendix A**.

After the soil samples were logged, sample intervals were selected for potential testing based on the presence or absence of staining on the soil samples. In general, intervals were from 0 to 5 feet, 5 to 10 feet, and 10 to 15 feet below ground surface (bgs). Unless staining was present, soil samples were homogenized and collected from the entire 5 foot interval. If staining was present, the sample interval was limited to the stained section. If groundwater was not encountered by a depth of 15 feet, the boring was advanced to 20 feet for collection of a fourth sample interval (15-20 feet). Sample containers were collected for on-site immunoassay testing and for laboratory analysis by PCB Method 680.

Quality assurance/ quality control (QA/QC) samples consisting of equipment blanks (EB), duplicates (DUP), and matrix spike/matrix spike duplicate (MS/MSD) samples were collected at a rate of 10%, 10% and 5%, respectively, and submitted to the laboratory for analysis.

For proper identification in the field and proper tracking by the analytical laboratory, investigative and QA/QC samples were labeled in a clear and consistent fashion. Sample labels were wrapped in clear tape for waterproofing and glass sample containers were sealed in plastic bubble wrap bags.

A completed sample label was attached to each investigative or QC sample. The sample labels included the project name and number, sample number identification, initials of sampler, sampling location, required analysis, and date and time of sample collection.

The sample identification system for soil involved the following nomenclature "PMA-BS-A-BB-CC-DDD" where:

"PMA" denoted PCB Manufacturing Area

"BS" denoted Boundary Sample

"A" denoted

- # - Sample location number

"BB" denoted

- ## - Initial depth of sample interval

"CC" denoted

- ## - Final depth of sample

"DDD" denoted

- denoted QA/QC sampling

For example, PMA-BS-10-05-10-DUP indicated the soil sample was obtained from sample boring BS-10 from 5 to 10 feet below ground surface, and that the sample was a duplicate.

Samples were placed on ice inside a cooler immediately following sampling. Sampling containers were packed in such a way as to help prevent breakage and cross-contamination. Samples were shipped in coolers, each containing ice and ice packs to maintain inside temperature at approximately 4°C. Sample coolers were then sealed between the lid and sides of the cooler with a custody seal prior to shipment. Shipping arrangements were handled by a representative of Severn Trent laboratories (STL).

Field personnel maintained a sample log book and soil boring data sheets to record information sufficient to allow reconstruction of the sample collection and handling procedures at a later time. Chain-of-custody (COC) procedures were instituted and followed throughout the sampling activities. Samples were handled according to chain-of-custody protocols; the field sampler was personally responsible for the care and custody of the sample until transferred to a representative of STL.

Field personnel recorded the project identification and number, sample description/location, required analysis, date and time of sample collection, type and matrix of sample, number of sample containers, analysis requested/comments, and sampler signature/date/time, with permanent ink on the chain-of-custody. COC forms are included in **Appendix B**.

The samples were transferred from the URS field sampler to a representative of Severn Trent Laboratories (STL) in person after samples were collected and packaged for analysis. When transferring the possession of samples, the individuals relinquishing and receiving signed, dated, and noted the time

on the chain-of-custody. The field sampler signed the chain-of-custody form when relinquishing custody, made a copy to keep with the field logbook, and provided the original chain-of-custody to the STL representative with the associated samples. Soil samples were shipped to STL in Savannah, Georgia on the same day they were sampled by means of an overnight courier.

Immunoassay Testing Procedures

Boundary samples were initially analyzed on-site by an immunoassay test to determine if the concentration of PCBs present was above or below 25 mg/kg.

Immunoassay tests were conducted according to the specifications of the test kit manufacturer (Strategic Diagnostics Inc. (SDI)). These procedures are based on EPA SW-846 Method 4020. The tests for each mobilization were conducted in one simultaneous batch in order to compare against the same standard (Aroclor 1248). Two standards were run during each batch.

PCBs were extracted from the soil samples using a methanol solution. The filtrate of the extraction solution was put through a double dilution prior to the sequence of antibody incubation steps. At the conclusion of each test the two standards are tested against each other. If the magnitude of the number shown on the photometer was less than 0.3 the tests were within QC limits. All test batches were within acceptable QC limits. The samples being tested were compared against the standard with the negative reading. If the reading was negative or zero, the sample contained 25 mg/kg or more of PCBs.

Quality assurance/ quality control (QA/QC) samples consisting of duplicates (DUP) of 10% of the samples were analyzed for each batch.

Following the results of each batch, samples with screening results less than 25 mg/kg and individual samples associated with QA/QC samples were marked on the COC to be analyzed at the laboratory by Method 680 to confirm concentrations. Borings with at least one sample interval with concentrations above 25 mg/kg determined locations for step-out soil borings for the following stage of drilling. A total of 67 samples were analyzed both by immunoassay and by Method 680 in the laboratory. Two sample results were false negatives (screened below 25 mg/kg – laboratory analysis above 25 mg/kg) and three sample results were false positives (screened above 25 mg/kg – laboratory analysis below 25 mg/kg). Overall, 92% of immunoassay results were in agreement with laboratory results.

The results of the immunoassay testing and laboratory analysis are shown on **Table 1**.

Laboratory Results

A total of 75 samples (59 investigative soil samples, 8 field duplicates and 8 equipment blanks) were prepared by USEPA Method 3550B (soil) and Method 3520 (aqueous). Samples were analyzed for PCB homologues by USEPA Method 680. Samples were analyzed by STL of Savannah, Georgia, and submitted as part of sample delivery groups (SDG) KPS02, KPS07, KPS08, KPS09 and KPS13. QA/QC criteria were a combination of those criteria established in USEPA Method 680 and laboratory derived QC limits. Evaluation of the analytical data followed procedures outlined in the USEPA Contract Program National Functional Guidelines for Low Concentration Organic Review (USEPA 2001) where applicable to SW-846 Method 680. Based on the mentioned criteria, it is recommended that the results reported for these analyses be accepted for their intended use. Acceptable levels of accuracy and precision, based

on MS/MSD samples, laboratory control samples (LCS), and surrogate data were achieved for these SDGs with the noted exceptions. In addition, completeness, defined to be the percentage of analytical results which are judged to be valid, including estimated (J) data, was 99 percent.

A summary of laboratory detections is presented on **Table 2**. A copy of the laboratory results is presented in **Appendix C**.

Boundary Delineation

Based on the results of the field immunoassays and laboratory analyses for Total PCBs, the 25 mg/kg isoconcentration line was defined at the Former PCB Manufacturing Area (**Figure 1**). Since the 25 mg/kg Total PCB isocon is defined, the next phase of work will consist of the installation of three monitoring well clusters downgradient of the 25 mg/kg PCB isoconcentration line as defined in the "Phase III Site Investigation" section of the PCB Mobility and Migration Investigation Work Plan.

The three locations, designated as PMAMW-1, PMAMW-2, and PMAMW-3 on **Figure 1**, were selected to be downgradient of the 25 mg/kg Total PCB isoconcentration line and within the constraints imposed by site access limitations.

Each cluster will have a well installed with a 5 foot screen in the SHU (from approximately elevation 390 to 385) and a 5 foot screen in the MHU (from approximately elevation 355 to 350). Another cluster will be installed at soil sampling location PMA-S-4 (S0835). This groundwater sampling location is designated PMAMW-4. The shallower well will be completed in the SHU (from approximately elevation 390 to 385). The deeper well will be represented by the Plume Stability Monitoring Well PSMW-2.

Specialized drilling methods will be used to install these well clusters to minimize carry down of impacted soil from the unsaturated zone (e.g., roto-sonic cased techniques).

Groundwater samples will be collected quarterly using low-flow sampling techniques and analyzed for VOCs (USEPA Method 8260B), SVOCs (USEPA Method 8270C) and PCBs (USEPA Method 680) to determine if PCBs are migrating downgradient of this area of concern (**Figure 1**).

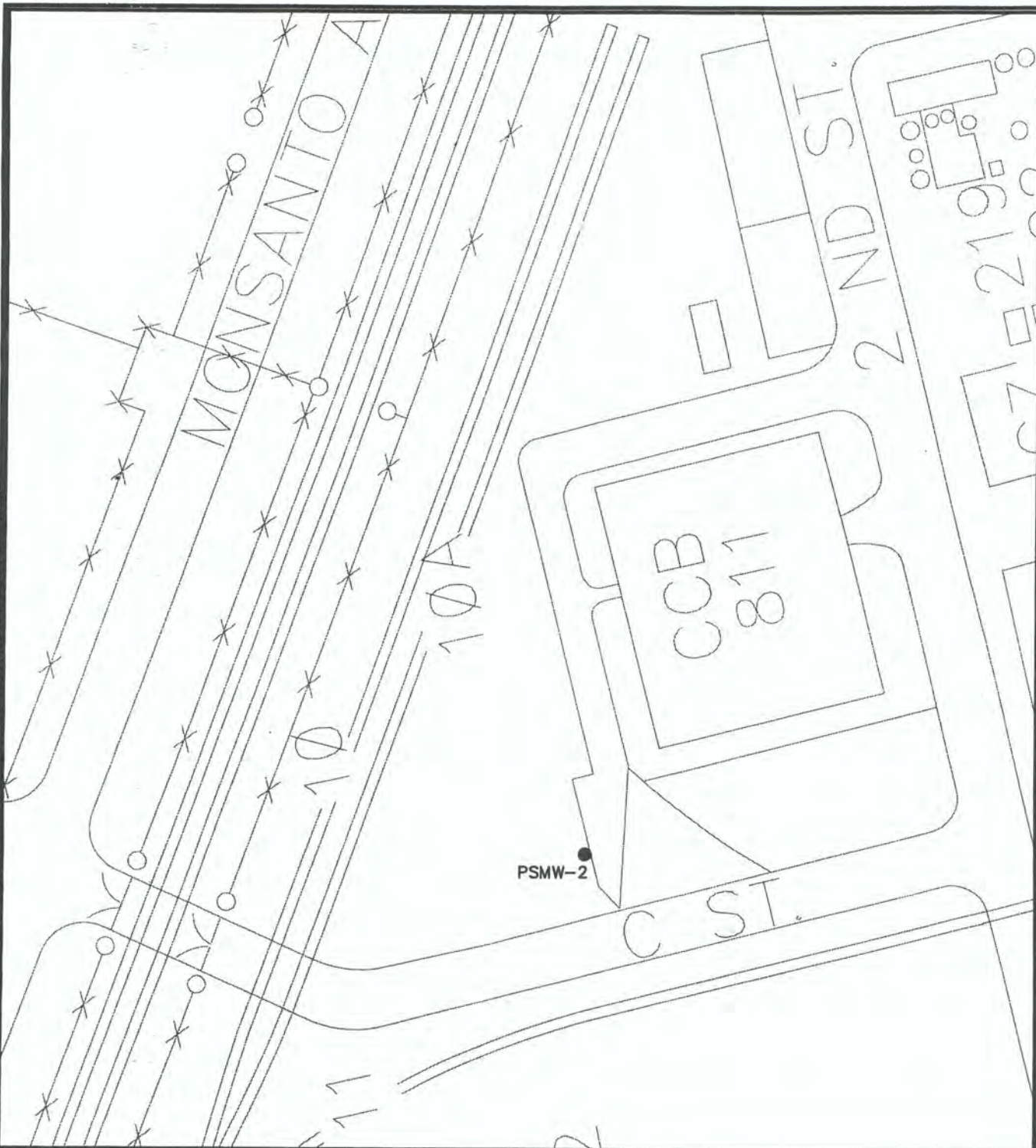
A groundwater monitoring report will be prepared and submitted to USEPA after each sampling round when sample analysis and data validation are completed. The report will include a discussion of sample collection procedures, groundwater elevation contour maps, a summary of the validated analytical laboratory data and copies of the laboratory data. Groundwater level elevation data from the four monitoring well clusters will be compiled by zone (i.e. SHU and MHU) and used to develop elevation contour maps.

A baseline groundwater report will be prepared at the completion of two years of sampling. Concentration versus time plots will be created for each monitoring well in order to depict temporal changes in the concentrations of key constituents. Analytical data from the baseline data collection period will be used to establish baseline statistical information such as normality, distribution, standard deviation, etc. The data distribution will be evaluated to determine if the data set is either normal, log normal or non-parametric. The baseline report will outline the statistical test or tests that will be used to determine if PCBs are

migrating from the Former PCB Manufacturing Area via the groundwater pathway.

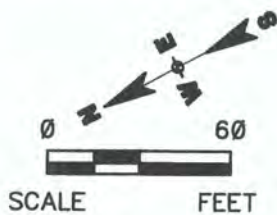
Figures





LEGEND

- GROUNDWATER PROFILE LOCATION



PCB MOBILITY AND MIGRATION INVESTIGATION
W.G. KRUMMICH FACILITY
SAUGET, ILLINOIS

PROJECT NO.
21561640.00000

URS

DRN. BY: djd 2/28/06
DSGN. BY: ws
CHKD. BY:

PSMW-2 Groundwater Profile

FIG. NO.
2

Table 2 Summary of PSMW-2 Vertical Profiling Total VOC, Total SVOC and Total PCB Concentrations

Sample ID	Chemical	Result	Units	Total VOCs	Total SVOCs	Total PCBs
GWPZ-17.5 Unfiltered	Chlorobenzene	140	ug/L	140		
GWPZ-17.5 Unfiltered	1,3-Dichlorobenzene	41	ug/L			
	1,4-Dichlorobenzene	250	ug/L		291	
GWPZ-17.5 Filtered	1,3-Dichlorobenzene	16	ug/L			
	1,4-Dichlorobenzene	95	ug/L		111	
GWP-PSMW-2-30 Unfiltered	Benzene	16	ug/L			
	Carbon Disulfide	1.4	ug/L			
	Chlorobenzene	860	ug/L			
	cis-1,2-Dichloroethene	2.1	ug/L	879.5		
GWP-PSMW-2-30 Unfiltered	1,4-Dichlorobenzene	3000	ug/L		3000	
GWP-PSMW-2-30 Filtered	1,4-Dichlorobenzene	690	ug/L			
	P-Chloroaniline	29	ug/L		719	
GWP-PSMW-2-30 Unfiltered	Dichlorobiphenyl	0.28	ug/L			
	Monochlorobiphenyl	0.8	ug/L			1.08
GWP-PSMW-2-50 Unfiltered	Benzene	240	ug/L			
	Chlorobenzene	990	ug/L			
	cis-1,2-Dichloroethene	3.6	ug/L			
	Ethylbenzene	56	ug/L			
	Toluene	64	ug/L			
	trans-1,2-Dichloroethene	2.1	ug/L			
	Xylenes, Total	340	ug/L	1695.7		
GWP-PSMW-2-50 Unfiltered	1,2,4-Trichlorobenzene	320	ug/L			
	1,3-Dichlorobenzene	400	ug/L			
	1,4-Dichlorobenzene	2200	ug/L		2920	
GWP-PSMW-2-50 Filtered	1,2,4-Trichlorobenzene	14	ug/L			
	1,2-Dichlorobenzene	18	ug/L			
	1,3-Dichlorobenzene	39	ug/L			
	1,4-Dichlorobenzene	170	ug/L			
	P-Chloroaniline	96	ug/L		337	
GWP-PSMW-2-50 Unfiltered	Dichlorobiphenyl	0.97	ug/L			0.97
GWP-PSMW-2-70 Unfiltered	Benzene	5700	ug/L			
	Chlorobenzene	17000	ug/L			
	Xylenes, Total	11	ug/L	22711		
GWP-PSMW-2-70 Unfiltered	1,2,4-Trichlorobenzene	10	ug/L			
	1,3-Dichlorobenzene	110	ug/L			
	1,4-Dichlorobenzene	5600	ug/L			
	2,4-Dichlorophenol	39	ug/L			
	2-Chlorophenol	25	ug/L			
	P-Chloroaniline	110	ug/L			
	Phenol	34	ug/L		5928	
GWP-PSMW-2-70 Filtered	1,4-Dichlorobenzene	1900	ug/L		1900	
GWP-PSMW-2-70 Unfiltered	Dichlorobiphenyl	1.5	ug/L			1.5
GWP-PSMW-2-90 Unfiltered	Benzene	620	ug/L			
	Chlorobenzene	2600	ug/L	3220		
GWP-PSMW-2-90 Unfiltered	1,4-Dichlorobenzene	91	ug/L			
	2-Chlorophenol	11	ug/L			
	P-Chloroaniline	20	ug/L			
	Phenol	9.7	ug/L		131.7	
GWP-PSMW-2-90 Filtered	1,4-Dichlorobenzene	42	ug/L			
	2-Chlorophenol	13	ug/L			
	Phenol	15	ug/L		70	
GWP-PSMW-2-90 Unfiltered	Dichlorobiphenyl	2.4	ug/L			
	Hexachlorobiphenyl	1.9	ug/L			
	Pentachlorobiphenyl	2.8	ug/L			
	Tetrachlorobiphenyl	4.7	ug/L			
	Trichlorobiphenyl	2.4	ug/L			14.2
GWP-PSMW-2-110 Unfiltered	Benzene	880	ug/L			
	Chlorobenzene	2500	ug/L	3380		
GWP-PSMW-2-110 Unfiltered	1,2,4-Trichlorobenzene	48	ug/L			
	1,3-Dichlorobenzene	120	ug/L			
	1,4-Dichlorobenzene	1100	ug/L			
	2,4-Dichlorophenol	14	ug/L			
	2-Chlorophenol	14	ug/L			
	P-Chloroaniline	50	ug/L			
	Phenol	13	ug/L		1359	
GWP-PSMW-2-110 Filtered	1,3-Dichlorobenzene	11	ug/L			
	1,4-Dichlorobenzene	81	ug/L			
	P-Chloroaniline	48	ug/L			
	Phenol	15	ug/L		155	
GWP-PSMW-2-110 Unfiltered	Dichlorobiphenyl	1.7	ug/L			
	Monochlorobiphenyl	1.7	ug/L			
	Pentachlorobiphenyl	3	ug/L			
	Tetrachlorobiphenyl	2.9	ug/L			9.3

Tables

See last page of table for notes

Table 1
Immunoassay Field Screening Results

Sample ID	Immunoassay Field Results		Laboratory Results (mg/kg)	Notes
	Photometer Output (absorbance)*	Results at or above 25 ppm		
PMA-BS-1-00-05	-0.16	X	Not Run	
PMA-BS-1-05-10	0.82		Not Run	
PMA-BS-1-10-15	0.56		Not Run	**A duplicate sample collected for Immunoassay screening only (Photometer Output = 0.44)
PMA-BS-2-01-03	-0.58	X	Not Run	
PMA-BS-2-05-10	0.26		Not Run	
PMA-BS-2-10-15	1.52		Not Run	
PMA-BS-3-01-04	0.70		ND	Run-due to duplicate sample
PMA-BS-3-01-04-DUP	0.63		ND	Run-due to duplicate sample
PMA-BS-3-05-10	-0.20	X	Not Run	
PMA-BS-3-12-15	1.01		Not Run	
PMA-BS-4-01-04	0.26		1.209	Run
PMA-BS-4-05-10	0.70		6.3	Run
PMA-BS-4-10-12	0.58		0.0516	Run
PMA-BS-5-00-05	-0.41	X	Not Run	
PMA-BS-5-08-10	-0.72	X	Not Run	
PMA-BS-5-10-12	-0.76	X	Not Run	
PMA-BS-6-02-04	0.52		148.1	Run
PMA-BS-6-06-10	0.03		2.158	Run
PMA-BS-6-10-15	0.50		0.1439	Run
PMA-BS-7-00-05	0.46		ND	Run
PMA-BS-7-05-10	0.50		0.022	Run
PMA-BS-7-05-10-DUP	0.38		0.0216	Run
PMA-BS-7-10-15	0.29		ND	Run
PMA-BS-8-00-05	0.03		0.9496	Run
PMA-BS-8-05-10	0.52		0.1873	Run
PMA-BS-8-10-15	0.64		ND	Run

Table 1
Immunoassay Field Screening Results

Sample ID	Immunoassay Field Results		Laboratory Results (mg/kg)	Notes
	Photometer Output (absorbance)*	Results at or above 25 ppm		
PMA-BS-9-00-05	0.88		17.21	Run
PMA-BS-9-05-10	2.11		0.025	Run
PMA-BS-9-10-15	1.40		0.16	Run
PMA-BS-10-00-05	1.53		0.037	Run
PMA-BS-10-05-10	1.30		ND	Run
PMA-BS-10-05-10-DUP	1.51		ND	Run
PMA-BS-10-10-15	1.16		ND	Run
PMA-BS-11-00-05	0.49		0.13	Run
PMA-BS-11-05-10	0.55		ND	Run
PMA-BS-11-10-15	0.59		ND	Run
PMA-BS-11-10-15-DUP	0.44		ND	Run
PMA-BS-11-15-20	0.45		0.644	Run
PMA-BS-12-02-04	0.68		ND	Run
PMA-BS-12-05-10	0.47		ND	Run
PMA-BS-12-10-15	0.31		9.23	Run
PMA-BS-12-15-20	0.61		ND	Run
PMA-BS-13-00-05	0.17		30.5	Run
PMA-BS-13-06-10	0.45		17.03	Run
PMA-BS-13-10-15	0.01		2.29	Run
PMA-BS-14-00-05	0.49		4.88	Run
PMA-BS-14-05-10	0.60		0.15	Run
PMA-BS-14-10-15	0.39		0.8512	Run
PMA-BS-15-00-05	0.35		Not Run	
PMA-BS-15-05-10	0.54		1.237	Run-due to duplicate sample
PMA-BS-15-05-10-DUP	0.96		1.15	Run-due to duplicate sample
PMA-BS-15-10-15	-0.49	X	Not Run	
PMA-BS-16-00-05	-0.23	X	Not Run	
PMA-BS-16-05-10	1.41		0.112	Run-due to sample being associated with an equipment bank
PMA-BS-16-10-15	1.48		Not Run	

See last page of table for notes

Table 1
Immunoassay Field Screening Results

Sample ID	Immunoassay Field Results		Laboratory Results (mg/kg)	Notes
	Photometer Output (absorbance)*	Results at or above 25 ppm		
PMA-BS-17-02-04	-0.54	X	19.0354	Run-due to sample being associated with an equipment bank
PMA-BS-17-05-10	-0.60	X	Not Run	
PMA-BS-17-10-15	-0.41	X	Not Run	
PMA-BS-18-00-05	-0.30	X	Not Run	
PMA-BS-18-05-10	-0.49	X	Not Run	
PMA-BS-18-10-15	-0.43	X	0.1135	Run-due to duplicate sample
PMA-BS-18-10-15-DUP	0.16		ND	Run-due to duplicate sample
PMA-BS-19-00-05	0.08		0.0495	Run
PMA-BS-19-05-10	1.77		0.3825	Run -- **A duplicate sample collected for Immunoassay screening only (Photometer Output = 0.25)
PMA-BS-19-10-15	0.07		ND	Run
PMA-BS-20-00-05	-0.78	X	Not Run	
PMA-BS-20-05-10	-0.29	X	Not Run	
PMA-BS-20-10-15	0.07		Not Run	
PMA-BS-21-00-05	1.05		1.28	Run
PMA-BS-21-05-10	0.62		0.894	Run
PMA-BS-21-10-15	0.92		0.146	Run
PMA-BS-22-00-05	0.82		0.707	Run
PMA-BS-22-05-10	-0.30	X	4.001	Run
PMA-BS-22-10-15	1.28		0.0898	Run
PMA-BS-23-00-05	1.08		0.041	Run
PMA-BS-23-05-10	1.03		ND	Run
PMA-BS-23-10-15	1.62		0.526	Run
PMA-BS-24-00-05	1.14		1.384	Run
PMA-BS-24-00-05-DUP	0.92		1.301	Run
PMA-BS-24-05-10	1.49		ND	Run
PMA-BS-24-10-15	0.74		ND	Run
PMA-BS-25-00-05	1.84		19.6	Run
PMA-BS-25-05-10	1.47		0.92	Run
PMA-BS-25-10-15	1.08		0.0088	Run

Table 2
Summary of PCB Detections

Sample ID	Sample Date	Chemical	Result	Units	Lab Qualifiers	URS Qualifiers
PMA-BS-22-05-10	2/22/2006	Decachlorobiphenyl	350	ug/Kg		J
PMA-BS-22-05-10	2/22/2006	Heptachlorobiphenyl	1500	ug/Kg		J
PMA-BS-22-05-10	2/22/2006	Hexachlorobiphenyl	1400	ug/Kg		J
PMA-BS-22-05-10	2/22/2006	Nonachlorobiphenyl	190	ug/Kg		J
PMA-BS-22-05-10	2/22/2006	Octachlorobiphenyl	390	ug/Kg		J
PMA-BS-22-05-10	2/22/2006	Pentachlorobiphenyl	160	ug/Kg		J
PMA-BS-22-05-10	2/22/2006	Tetrachlorobiphenyl	11	ug/Kg		J
		Total PCBs	4001	ug/Kg		
		Total PCBs	4.001	mg/kg		
PMA-BS-22-10-15	2/22/2006	Dichlorobiphenyl	27	ug/Kg		
PMA-BS-22-10-15	2/22/2006	Hexachlorobiphenyl	8.8	ug/Kg		
PMA-BS-22-10-15	2/22/2006	Monochlorobiphenyl	27	ug/Kg		
PMA-BS-22-10-15	2/22/2006	Tetrachlorobiphenyl	27	ug/Kg		
		Total PCBs	89.8	ug/Kg		
		Total PCBs	0.0898	mg/kg		
PMA-BS-23-00-05	2/22/2006	Hexachlorobiphenyl	17	ug/Kg		J
PMA-BS-23-00-05	2/22/2006	Pentachlorobiphenyl	24	ug/Kg		J
		Total PCBs	41	ug/Kg		
		Total PCBs	0.041	mg/kg		
PMA-BS-23-10-15	2/22/2006	Decachlorobiphenyl	440	ug/Kg		J
PMA-BS-23-10-15	2/22/2006	Hexachlorobiphenyl	10	ug/Kg		J
PMA-BS-23-10-15	2/22/2006	Nonachlorobiphenyl	76	ug/Kg		J
		Total PCBs	526	ug/Kg		
		Total PCBs	0.526	mg/kg		
PMA-BS-24-00-05	2/22/2006	Decachlorobiphenyl	430	ug/Kg		
PMA-BS-24-00-05	2/22/2006	Heptachlorobiphenyl	160	ug/Kg		
PMA-BS-24-00-05	2/22/2006	Hexachlorobiphenyl	270	ug/Kg		
PMA-BS-24-00-05	2/22/2006	Nonachlorobiphenyl	250	ug/Kg		
PMA-BS-24-00-05	2/22/2006	Octachlorobiphenyl	81	ug/Kg		
PMA-BS-24-00-05	2/22/2006	Pentachlorobiphenyl	140	ug/Kg		
PMA-BS-24-00-05	2/22/2006	Tetrachlorobiphenyl	53	ug/Kg		J
		Total PCBs	1384	ug/Kg		
		Total PCBs	1.384	mg/kg		
PMA-BS-24-00-05-DUP	2/22/2006	Decachlorobiphenyl	400	ug/Kg		
PMA-BS-24-00-05-DUP	2/22/2006	Dichlorobiphenyl	43	ug/Kg		
PMA-BS-24-00-05-DUP	2/22/2006	Heptachlorobiphenyl	160	ug/Kg		
PMA-BS-24-00-05-DUP	2/22/2006	Hexachlorobiphenyl	240	ug/Kg		
PMA-BS-24-00-05-DUP	2/22/2006	Nonachlorobiphenyl	240	ug/Kg		
PMA-BS-24-00-05-DUP	2/22/2006	Octachlorobiphenyl	67	ug/Kg		
PMA-BS-24-00-05-DUP	2/22/2006	Pentachlorobiphenyl	120	ug/Kg		
PMA-BS-24-00-05-DUP	2/22/2006	Tetrachlorobiphenyl	31	ug/Kg		J
		Total PCBs	1301	ug/Kg		
		Total PCBs	1.301	mg/kg		

Table 2
Summary of PCB Detections

Sample ID	Sample Date	Chemical	Result	Units	Lab Qualifiers	URS Qualifiers
PMA-BS-19-05-10	2/10/2006	Dichlorobiphenyl	8.5	ug/Kg		
PMA-BS-19-05-10	2/10/2006	Heptachlorobiphenyl	90	ug/Kg		
PMA-BS-19-05-10	2/10/2006	Hexachlorobiphenyl	110	ug/Kg		
PMA-BS-19-05-10	2/10/2006	Octachlorobiphenyl	34	ug/Kg		
PMA-BS-19-05-10	2/10/2006	Pentachlorobiphenyl	68	ug/Kg		
PMA-BS-19-05-10	2/10/2006	Tetrachlorobiphenyl	58	ug/Kg		
PMA-BS-19-05-10	2/10/2006	Trichlorobiphenyl	14	ug/Kg		
		Total PCBs	382.5	ug/Kg		
		Total PCBs	0.3825	mg/kg		
PMA-BS-21-00-05	2/22/2006	Decachlorobiphenyl	200	ug/Kg		J
PMA-BS-21-00-05	2/22/2006	Heptachlorobiphenyl	170	ug/Kg		J
PMA-BS-21-00-05	2/22/2006	Hexachlorobiphenyl	340	ug/Kg		J
PMA-BS-21-00-05	2/22/2006	Nonachlorobiphenyl	66	ug/Kg		J
PMA-BS-21-00-05	2/22/2006	Octachlorobiphenyl	64	ug/Kg		J
PMA-BS-21-00-05	2/22/2006	Pentachlorobiphenyl	340	ug/Kg		J
PMA-BS-21-00-05	2/22/2006	Tetrachlorobiphenyl	100	ug/Kg		J
		Total PCBs	1280	ug/Kg		
		Total PCBs	1.28	mg/kg		
PMA-BS-21-05-10	2/22/2006	Decachlorobiphenyl	190	ug/Kg		
PMA-BS-21-05-10	2/22/2006	Heptachlorobiphenyl	120	ug/Kg		
PMA-BS-21-05-10	2/22/2006	Hexachlorobiphenyl	280	ug/Kg		
PMA-BS-21-05-10	2/22/2006	Nonachlorobiphenyl	69	ug/Kg		
PMA-BS-21-05-10	2/22/2006	Octachlorobiphenyl	35	ug/Kg		
PMA-BS-21-05-10	2/22/2006	Pentachlorobiphenyl	200	ug/Kg		
		Total PCBs	894	ug/Kg		
		Total PCBs	0.894	mg/kg		
PMA-BS-21-10-15	2/22/2006	Decachlorobiphenyl	71	ug/Kg		J
PMA-BS-21-10-15	2/22/2006	Hexachlorobiphenyl	21	ug/Kg		J
PMA-BS-21-10-15	2/22/2006	Nonachlorobiphenyl	30	ug/Kg		J
PMA-BS-21-10-15	2/22/2006	Pentachlorobiphenyl	24	ug/Kg		J
		Total PCBs	146	ug/Kg		
		Total PCBs	0.146	mg/kg		
PMA-BS-22-00-05	2/22/2006	Decachlorobiphenyl	67	ug/Kg		J
PMA-BS-22-00-05	2/22/2006	Heptachlorobiphenyl	110	ug/Kg		J
PMA-BS-22-00-05	2/22/2006	Hexachlorobiphenyl	230	ug/Kg		J
PMA-BS-22-00-05	2/22/2006	Nonachlorobiphenyl	32	ug/Kg		J
PMA-BS-22-00-05	2/22/2006	Octachlorobiphenyl	22	ug/Kg		J
PMA-BS-22-00-05	2/22/2006	Pentachlorobiphenyl	190	ug/Kg		J
PMA-BS-22-00-05	2/22/2006	Tetrachlorobiphenyl	56	ug/Kg		J
		Total PCBs	707	ug/Kg		
		Total PCBs	0.707	mg/kg		

Table 2
Summary of PCB Detections

Sample ID	Sample Date	Chemical	Result	Units	Lab Qualifiers	URS Qualifiers
PMA-BS-15-05-10	2/7/06	Decachlorobiphenyl	280	ug/Kg		
PMA-BS-15-05-10	2/7/06	Heptachlorobiphenyl	240	ug/Kg		
PMA-BS-15-05-10	2/7/06	Hexachlorobiphenyl	440	ug/Kg		
PMA-BS-15-05-10	2/7/06	Pentachlorobiphenyl	180	ug/Kg		
PMA-BS-15-05-10	2/7/06	Tetrachlorobiphenyl	97	ug/Kg	*	J
		Total PCBs	1237	ug/Kg		
		Total PCBs	1.237	mg/kg		
PMA-BS-15-05-10-DUP	2/7/06	Heptachlorobiphenyl	250	ug/Kg		
PMA-BS-15-05-10-DUP	2/7/06	Hexachlorobiphenyl	500	ug/Kg		
PMA-BS-15-05-10-DUP	2/7/06	Pentachlorobiphenyl	240	ug/Kg		
PMA-BS-15-05-10-DUP	2/7/06	Tetrachlorobiphenyl	160	ug/Kg	*	J
		Total PCBs	1150	ug/Kg		
		Total PCBs	1.15	mg/kg		
PMA-BS-16-06-10	2/7/06	Heptachlorobiphenyl	20	ug/Kg		
PMA-BS-16-06-10	2/7/06	Hexachlorobiphenyl	40	ug/Kg		
PMA-BS-16-06-10	2/7/06	Pentachlorobiphenyl	32	ug/Kg		
PMA-BS-16-06-10	2/7/06	Tetrachlorobiphenyl	20	ug/Kg	*	J
		Total PCBs	112	ug/Kg		
		Total PCBs	0.112	mg/kg		
PMA-BS-17-02-04	2/10/2006	Decachlorobiphenyl	16000	ug/Kg	D	
PMA-BS-17-02-04	2/10/2006	Heptachlorobiphenyl	290	ug/Kg		
PMA-BS-17-02-04	2/10/2006	Hexachlorobiphenyl	460	ug/Kg		
PMA-BS-17-02-04	2/10/2006	Nonachlorobiphenyl	1500	ug/Kg		
PMA-BS-17-02-04	2/10/2006	Octachlorobiphenyl	280	ug/Kg		
PMA-BS-17-02-04	2/10/2006	Pentachlorobiphenyl	390	ug/Kg		
PMA-BS-17-02-04	2/10/2006	Tetrachlorobiphenyl	110	ug/Kg		
PMA-BS-17-02-04	2/10/2006	Trichlorobiphenyl	5.4	ug/Kg		
		Total PCBs	19035.4	ug/Kg		
		Total PCBs	19.0354	mg/kg		
PMA-BS-18-10-15	2/10/2006	Decachlorobiphenyl	86	ug/Kg		J
PMA-BS-18-10-15	2/10/2006	Hexachlorobiphenyl	8.5	ug/Kg		
PMA-BS-18-10-15	2/10/2006	Nonachlorobiphenyl	19	ug/Kg		
		Total PCBs	113.5	ug/Kg		
		Total PCBs	0.1135	mg/kg		
PMA-BS-19-00-05	2/10/2006	Heptachlorobiphenyl	26	ug/Kg		
PMA-BS-19-00-05	2/10/2006	Hexachlorobiphenyl	16	ug/Kg		
PMA-BS-19-00-05	2/10/2006	Pentachlorobiphenyl	7.5	ug/Kg		
		Total PCBs	49.5	ug/Kg		
		Total PCBs	0.0495	mg/kg		

Table 2
Summary of PCB Detections

Sample ID	Sample Date	Chemical	Result	Units	Lab Qualifiers	URS Qualifiers
PMA-BS-13-06-10	2/7/06	Decachlorobiphenyl	660	ug/Kg		
PMA-BS-13-06-10	2/7/06	Dichlorobiphenyl	2500	ug/Kg		
PMA-BS-13-06-10	2/7/06	Heptachlorobiphenyl	150	ug/Kg		
PMA-BS-13-06-10	2/7/06	Hexachlorobiphenyl	290	ug/Kg		
PMA-BS-13-06-10	2/7/06	Monochlorobiphenyl	130	ug/Kg		
PMA-BS-13-06-10	2/7/06	Pentachlorobiphenyl	2000	ug/Kg		
PMA-BS-13-06-10	2/7/06	Tetrachlorobiphenyl	8100	ug/Kg	*	J
PMA-BS-13-06-10	2/7/06	Trichlorobiphenyl	3200	ug/Kg		
		Total PCBs	17030	ug/Kg		
		Total PCBs	17.03	mg/kg		
PMA-BS-13-10-15	2/7/06	Dichlorobiphenyl	130	ug/Kg		
PMA-BS-13-10-15	2/7/06	Heptachlorobiphenyl	590	ug/Kg		
PMA-BS-13-10-15	2/7/06	Hexachlorobiphenyl	920	ug/Kg		
PMA-BS-13-10-15	2/7/06	Pentachlorobiphenyl	330	ug/Kg		
PMA-BS-13-10-15	2/7/06	Tetrachlorobiphenyl	210	ug/Kg	*	J
PMA-BS-13-10-15	2/7/06	Trichlorobiphenyl	110	ug/Kg		
		Total PCBs	2290	ug/Kg		
		Total PCBs	2.29	mg/kg		
PMA-BS-14-00-05	2/7/06	Decachlorobiphenyl	1500	ug/Kg		
PMA-BS-14-00-05	2/7/06	Heptachlorobiphenyl	960	ug/Kg		
PMA-BS-14-00-05	2/7/06	Hexachlorobiphenyl	1600	ug/Kg		
PMA-BS-14-00-05	2/7/06	Nonachlorobiphenyl	270	ug/Kg		
PMA-BS-14-00-05	2/7/06	Octachlorobiphenyl	220	ug/Kg		
PMA-BS-14-00-05	2/7/06	Pentachlorobiphenyl	330	ug/Kg		
		Total PCBs	4880	ug/Kg		
		Total PCBs	4.88	mg/kg		
PMA-BS-14-05-10	2/7/06	Hexachlorobiphenyl	150	ug/Kg		
		Total PCBs	150	ug/Kg		
		Total PCBs	0.15	mg/kg		
PMA-BS-14-10-15	2/7/06	Decachlorobiphenyl	150	ug/Kg		
PMA-BS-14-10-15	2/7/06	Heptachlorobiphenyl	140	ug/Kg		
PMA-BS-14-10-15	2/7/06	Hexachlorobiphenyl	250	ug/Kg		
PMA-BS-14-10-15	2/7/06	Nonachlorobiphenyl	60	ug/Kg		
PMA-BS-14-10-15	2/7/06	Octachlorobiphenyl	45	ug/Kg		
PMA-BS-14-10-15	2/7/06	Pentachlorobiphenyl	120	ug/Kg		
PMA-BS-14-10-15	2/7/06	Tetrachlorobiphenyl	81	ug/Kg	*	J
PMA-BS-14-10-15	2/7/06	Trichlorobiphenyl	5.2	ug/Kg		
		Total PCBs	851.2	ug/Kg		
		Total PCBs	0.8512	mg/kg		

Table 2
Summary of PCB Detections

Sample ID	Sample Date	Chemical	Result	Units	Lab Qualifiers	URS Qualifiers
PMA-BS-9-05-10	2/8/06	Decachlorobiphenyl	25	ug/Kg		
		Total PCBs	25	ug/Kg		
		Total PCBs	0.025	mg/kg		
PMA-BS-9-10-15	2/8/2006	Octachlorobiphenyl	160	ug/Kg		J
		Total PCBs	160	ug/Kg		
		Total PCBs	0.16	mg/kg		
PMA-BS-10-00-05	2/8/2006	Decachlorobiphenyl	24	ug/Kg		
PMA-BS-10-00-05	2/8/2006	Pentachlorobiphenyl	13	ug/Kg		
		Total PCBs	37	ug/Kg		
		Total PCBs	0.037	mg/kg		
PMA-BS-11-00-05	2/7/06	Heptachlorobiphenyl	18	ug/Kg		
PMA-BS-11-00-05	2/7/06	Hexachlorobiphenyl	22	ug/Kg		
PMA-BS-11-00-05	2/7/06	Pentachlorobiphenyl	33	ug/Kg		
PMA-BS-11-00-05	2/7/06	Tetrachlorobiphenyl	46	ug/Kg	*	J
PMA-BS-11-00-05	2/7/06	Trichlorobiphenyl	11	ug/Kg		
		Total PCBs	130	ug/Kg		
		Total PCBs	0.13	mg/kg		
PMA-BS-11-15-20	2/7/06	Hexachlorobiphenyl	120	ug/Kg		
PMA-BS-11-15-20	2/7/06	Pentachlorobiphenyl	200	ug/Kg		
PMA-BS-11-15-20	2/7/06	Tetrachlorobiphenyl	260	ug/Kg	*	J
PMA-BS-11-15-20	2/7/06	Trichlorobiphenyl	64	ug/Kg		
		Total PCBs	644	ug/Kg		
		Total PCBs	0.644	mg/kg		
PMA-BS-12-10-15	2/7/06	Decachlorobiphenyl	2100	ug/Kg		
PMA-BS-12-10-15	2/7/06	Heptachlorobiphenyl	1100	ug/Kg		
PMA-BS-12-10-15	2/7/06	Hexachlorobiphenyl	2900	ug/Kg		
PMA-BS-12-10-15	2/7/06	Nonachlorobiphenyl	530	ug/Kg		
PMA-BS-12-10-15	2/7/06	Octachlorobiphenyl	320	ug/Kg		
PMA-BS-12-10-15	2/7/06	Pentachlorobiphenyl	1200	ug/Kg		
PMA-BS-12-10-15	2/7/06	Tetrachlorobiphenyl	920	ug/Kg	*	J
PMA-BS-12-10-15	2/7/06	Trichlorobiphenyl	160	ug/Kg		
		Total PCBs	9230	ug/Kg		
		Total PCBs	9.23	mg/kg		
PMA-BS-13-00-05	2/7/06	Dichlorobiphenyl	220	ug/Kg		
PMA-BS-13-00-05	2/7/06	Heptachlorobiphenyl	9400	ug/Kg		
PMA-BS-13-00-05	2/7/06	Hexachlorobiphenyl	14000	ug/Kg		
PMA-BS-13-00-05	2/7/06	Octachlorobiphenyl	2300	ug/Kg		
PMA-BS-13-00-05	2/7/06	Pentachlorobiphenyl	3400	ug/Kg		
PMA-BS-13-00-05	2/7/06	Tetrachlorobiphenyl	860	ug/Kg	*	J
PMA-BS-13-00-05	2/7/06	Trichlorobiphenyl	320	ug/Kg		
		Total PCBs	30500	ug/Kg		
		Total PCBs	30.5	mg/kg		

Table 2
Summary of PCB Detections

Sample ID	Sample Date	Chemical	Result	Units	Lab Qualifiers	URS Qualifiers
PMA-BS-6-10-15	1/30/2006	Heptachlorobiphenyl	20	ug/Kg		
PMA-BS-6-10-15	1/30/2006	Hexachlorobiphenyl	40	ug/Kg		
PMA-BS-6-10-15	1/30/2006	Pentachlorobiphenyl	28	ug/Kg		
PMA-BS-6-10-15	1/30/2006	Tetrachlorobiphenyl	48	ug/Kg		
PMA-BS-6-10-15	1/30/2006	Trichlorobiphenyl	7.9	ug/Kg		
		Total PCBs	143.9	ug/Kg		
		Total PCBs	0.1439	mg/kg		
PMA-BS-7-05-10	1/31/2006	Pentachlorobiphenyl	12	ug/Kg		
PMA-BS-7-05-10	1/31/2006	Tetrachlorobiphenyl	10	ug/Kg		
		Total PCBs	22	ug/Kg		
		Total PCBs	0.022	mg/kg		
PMA-BS-7-05-10-DUP	1/31/2006	Hexachlorobiphenyl	9.6	ug/Kg		
PMA-BS-7-05-10-DUP	1/31/2006	Pentachlorobiphenyl	12	ug/Kg		
		Total PCBs	21.6	ug/Kg		
		Total PCBs	0.0216	mg/kg		
PMA-BS-8-00-05	1/31/2006	Decachlorobiphenyl	34	ug/Kg		
PMA-BS-8-00-05	1/31/2006	Dichlorobiphenyl	8.6	ug/Kg		
PMA-BS-8-00-05	1/31/2006	Heptachlorobiphenyl	180	ug/Kg		
PMA-BS-8-00-05	1/31/2006	Hexachlorobiphenyl	280	ug/Kg		
PMA-BS-8-00-05	1/31/2006	Nonachlorobiphenyl	23	ug/Kg		
PMA-BS-8-00-05	1/31/2006	Octachlorobiphenyl	53	ug/Kg		
PMA-BS-8-00-05	1/31/2006	Pentachlorobiphenyl	200	ug/Kg		
PMA-BS-8-00-05	1/31/2006	Tetrachlorobiphenyl	150	ug/Kg		
PMA-BS-8-00-05	1/31/2006	Trichlorobiphenyl	21	ug/Kg		
		Total PCBs	949.6	ug/Kg		
		Total PCBs	0.9496	mg/kg		
PMA-BS-8-05-10	1/31/2006	Heptachlorobiphenyl	35	ug/Kg		
PMA-BS-8-05-10	1/31/2006	Hexachlorobiphenyl	59	ug/Kg		
PMA-BS-8-05-10	1/31/2006	Pentachlorobiphenyl	43	ug/Kg		
PMA-BS-8-05-10	1/31/2006	Tetrachlorobiphenyl	45	ug/Kg		
PMA-BS-8-05-10	1/31/2006	Trichlorobiphenyl	5.3	ug/Kg		
		Total PCBs	187.3	ug/Kg		
		Total PCBs	0.1873	mg/kg		
PMA-BS-9-00-05	2/8/06	Decachlorobiphenyl	11000	ug/Kg	D	
PMA-BS-9-00-05	2/8/06	Heptachlorobiphenyl	420	ug/Kg		
PMA-BS-9-00-05	2/8/06	Hexachlorobiphenyl	790	ug/Kg		
PMA-BS-9-00-05	2/8/06	Nonachlorobiphenyl	3300	ug/Kg		
PMA-BS-9-00-05	2/8/06	Octachlorobiphenyl	700	ug/Kg		
PMA-BS-9-00-05	2/8/06	Pentachlorobiphenyl	680	ug/Kg		
PMA-BS-9-00-05	2/8/06	Tetrachlorobiphenyl	320	ug/Kg	*	J
		Total PCBs	17210	ug/Kg		
		Total PCBs	17.21	mg/kg		

Table 2
Summary of PCB Detections

Sample ID	Sample Date	Chemical	Result	Units	Lab Qualifiers	URS Qualifiers
PMA-BS-4-01-04	1/30/2006	Decachlorobiphenyl	280	ug/Kg		
PMA-BS-4-01-04	1/30/2006	Heptachlorobiphenyl	85	ug/Kg		
PMA-BS-4-01-04	1/30/2006	Hexachlorobiphenyl	170	ug/Kg		
PMA-BS-4-01-04	1/30/2006	Nonachlorobiphenyl	140	ug/Kg		
PMA-BS-4-01-04	1/30/2006	Octachlorobiphenyl	40	ug/Kg		
PMA-BS-4-01-04	1/30/2006	Pentachlorobiphenyl	220	ug/Kg		
PMA-BS-4-01-04	1/30/2006	Tetrachlorobiphenyl	210	ug/Kg		
PMA-BS-4-01-04	1/30/2006	Trichlorobiphenyl	64	ug/Kg		
		Total PCBs	1209	ug/Kg		
		Total PCBs	1.209	mg/kg		
PMA-BS-4-05-10	1/30/2006	Dichlorobiphenyl	1100	ug/Kg		
PMA-BS-4-05-10	1/30/2006	Heptachlorobiphenyl	580	ug/Kg		
PMA-BS-4-05-10	1/30/2006	Hexachlorobiphenyl	1100	ug/Kg		
PMA-BS-4-05-10	1/30/2006	Monochlorobiphenyl	870	ug/Kg		
PMA-BS-4-05-10	1/30/2006	Octachlorobiphenyl	160	ug/Kg		
PMA-BS-4-05-10	1/30/2006	Pentachlorobiphenyl	900	ug/Kg		
PMA-BS-4-05-10	1/30/2006	Tetrachlorobiphenyl	1200	ug/Kg		
PMA-BS-4-05-10	1/30/2006	Trichlorobiphenyl	390	ug/Kg		
		Total PCBs	6300	ug/Kg		
		Total PCBs	6.3	mg/kg		
PMA-BS-4-10-12	1/30/2006	Dichlorobiphenyl	18	ug/Kg		
PMA-BS-4-10-12	1/30/2006	Hexachlorobiphenyl	13	ug/Kg		
PMA-BS-4-10-12	1/30/2006	Pentachlorobiphenyl	11	ug/Kg		
PMA-BS-4-10-12	1/30/2006	Trichlorobiphenyl	9.6	ug/Kg		
		Total PCBs	51.6	ug/Kg		
		Total PCBs	0.0516	mg/kg		
PMA-BS-6-02-04	1/30/2006	Decachlorobiphenyl	26000	ug/Kg		
PMA-BS-6-02-04	1/30/2006	Heptachlorobiphenyl	30000	ug/Kg		
PMA-BS-6-02-04	1/30/2006	Hexachlorobiphenyl	51000	ug/Kg	D	
PMA-BS-6-02-04	1/30/2006	Nonachlorobiphenyl	9400	ug/Kg		
PMA-BS-6-02-04	1/30/2006	Octachlorobiphenyl	12000	ug/Kg		
PMA-BS-6-02-04	1/30/2006	Pentachlorobiphenyl	18000	ug/Kg	D	
PMA-BS-6-02-04	1/30/2006	Tetrachlorobiphenyl	1700	ug/Kg		
		Total PCBs	148100	ug/Kg		
		Total PCBs	148.1	mg/kg		
PMA-BS-6-06-10	1/30/2006	Decachlorobiphenyl	370	ug/Kg		J
PMA-BS-6-06-10	1/30/2006	Heptachlorobiphenyl	350	ug/Kg		J
PMA-BS-6-06-10	1/30/2006	Hexachlorobiphenyl	580	ug/Kg		J
PMA-BS-6-06-10	1/30/2006	Nonachlorobiphenyl	370	ug/Kg		J
PMA-BS-6-06-10	1/30/2006	Octachlorobiphenyl	120	ug/Kg		J
PMA-BS-6-06-10	1/30/2006	Pentachlorobiphenyl	270	ug/Kg		J
PMA-BS-6-06-10	1/30/2006	Tetrachlorobiphenyl	98	ug/Kg		J
		Total PCBs	2158	ug/Kg		
		Total PCBs	2.158	mg/kg		

See last page of table for notes

Table 1
Immunoassay Field Screening Results

Sample ID	Immunoassay Field Results		Laboratory Results (mg/kg)	Notes
	Photometer Output (absorbance)*	Results at or above 25 ppm		
PMA-BS-26-00-05	-0.82	X	Not Run	
PMA-BS-26-05-10	1.00		0.394	Run-due to duplicate sample
PMA-BS-26-05-10-DUP	0.55		0.194	Run-due to duplicate sample
PMA-BS-26-10-15	-0.24	X	Not Run	
PMA-BS-27-00-05	-0.68	X	74	Run
PMA-BS-27-05-10	0.86		0.138	Run
PMA-BS-27-10-15	0.97		0.221	Run

Notes:

1. The immunoassay screening is calibrated to Aroclor 1248.
2. * The photometer output is measured as the difference in absorbance between the sample and the standard.
If this value is positive, this indicates that the PCB concentration of the sample is generally less than 25 ppm.
If this value is negative or 0, this indicates that the PCB concentration of the sample is generally greater than or equal to 25 ppm.

Table 2
Summary of PCB Detections

Sample ID	Sample Date	Chemical	Result	Units	Lab Qualifiers	URS Qualifiers
PMA-BS-25-00-05	2/22/2006	Decachlorobiphenyl	7300	ug/Kg		
PMA-BS-25-00-05	2/22/2006	Heptachlorobiphenyl	1900	ug/Kg		
PMA-BS-25-00-05	2/22/2006	Hexachlorobiphenyl	890	ug/Kg		
PMA-BS-25-00-05	2/22/2006	Nonachlorobiphenyl	7100	ug/Kg		
PMA-BS-25-00-05	2/22/2006	Octachlorobiphenyl	1300	ug/Kg		
PMA-BS-25-00-05	2/22/2006	Pentachlorobiphenyl	670	ug/Kg		
PMA-BS-25-00-05	2/22/2006	Tetrachlorobiphenyl	330	ug/Kg		
PMA-BS-25-00-05	2/22/2006	Trichlorobiphenyl	110	ug/Kg		
		Total PCBs	19600	ug/Kg		
		Total PCBs	19.6	mg/kg		
PMA-BS-25-05-10	2/22/2006	Decachlorobiphenyl	480	ug/Kg		
PMA-BS-25-05-10	2/22/2006	Heptachlorobiphenyl	86	ug/Kg		
PMA-BS-25-05-10	2/22/2006	Hexachlorobiphenyl	140	ug/Kg		
PMA-BS-25-05-10	2/22/2006	Nonachlorobiphenyl	88	ug/Kg		
PMA-BS-25-05-10	2/22/2006	Octachlorobiphenyl	31	ug/Kg		
PMA-BS-25-05-10	2/22/2006	Pentachlorobiphenyl	67	ug/Kg		
PMA-BS-25-05-10	2/22/2006	Tetrachlorobiphenyl	28	ug/Kg		
		Total PCBs	920	ug/Kg		
		Total PCBs	0.92	mg/kg		
PMA-BS-25-10-15	2/22/2006	Tetrachlorobiphenyl	8.8	ug/Kg		
		Total PCBs	8.8	ug/Kg		
		Total PCBs	0.0088	mg/kg		
PMA-BS-26-05-10	2/22/2006	Decachlorobiphenyl	38	ug/Kg		
PMA-BS-26-05-10	2/22/2006	Heptachlorobiphenyl	42	ug/Kg		
PMA-BS-26-05-10	2/22/2006	Hexachlorobiphenyl	72	ug/Kg		J
PMA-BS-26-05-10	2/22/2006	Pentachlorobiphenyl	84	ug/Kg		J
PMA-BS-26-05-10	2/22/2006	Tetrachlorobiphenyl	140	ug/Kg		J
PMA-BS-26-05-10	2/22/2006	Trichlorobiphenyl	18	ug/Kg		
		Total PCBs	394	ug/Kg		
		Total PCBs	0.394	mg/kg		
PMA-BS-26-05-10-DUP	2/22/2006	Heptachlorobiphenyl	21	ug/Kg		J
PMA-BS-26-05-10-DUP	2/22/2006	Hexachlorobiphenyl	37	ug/Kg		J
PMA-BS-26-05-10-DUP	2/22/2006	Pentachlorobiphenyl	45	ug/Kg		J
PMA-BS-26-05-10-DUP	2/22/2006	Tetrachlorobiphenyl	81	ug/Kg		J
PMA-BS-26-05-10-DUP	2/22/2006	Trichlorobiphenyl	10	ug/Kg		J
		Total PCBs	194	ug/Kg		
		Total PCBs	0.194	mg/kg		
PMA-BS-27-00-05	2/22/2006	Decachlorobiphenyl	31000	ug/Kg		
PMA-BS-27-00-05	2/22/2006	Heptachlorobiphenyl	2400	ug/Kg		
PMA-BS-27-00-05	2/22/2006	Hexachlorobiphenyl	3000	ug/Kg		
PMA-BS-27-00-05	2/22/2006	Nonachlorobiphenyl	29000	ug/Kg		
PMA-BS-27-00-05	2/22/2006	Octachlorobiphenyl	4700	ug/Kg		
PMA-BS-27-00-05	2/22/2006	Pentachlorobiphenyl	2200	ug/Kg		
PMA-BS-27-00-05	2/22/2006	Tetrachlorobiphenyl	1700	ug/Kg		
		Total PCBs	74000	ug/Kg		
		Total PCBs	74	mg/kg		

Table 2
Summary of PCB Detections

Sample ID	Sample Date	Chemical	Result	Units	Lab Qualifiers	URS Qualifiers
PMA-BS-27-05-10	2/22/2006	Decachlorobiphenyl	30	ug/Kg		
PMA-BS-27-05-10	2/22/2006	Hexachlorobiphenyl	20	ug/Kg		
PMA-BS-27-05-10	2/22/2006	Nonachlorobiphenyl	25	ug/Kg		
PMA-BS-27-05-10	2/22/2006	Pentachlorobiphenyl	16	ug/Kg		
PMA-BS-27-05-10	2/22/2006	Tetrachlorobiphenyl	31	ug/Kg		
PMA-BS-27-05-10	2/22/2006	Trichlorobiphenyl	16	ug/Kg		
		Total PCBs	138	ug/Kg		
		Total PCBs	0.138	mg/kg		
PMA-BS-27-10-15	2/22/2006	Decachlorobiphenyl	56	ug/Kg		
PMA-BS-27-10-15	2/22/2006	Heptachlorobiphenyl	30	ug/Kg		
PMA-BS-27-10-15	2/22/2006	Hexachlorobiphenyl	43	ug/Kg		
PMA-BS-27-10-15	2/22/2006	Nonachlorobiphenyl	50	ug/Kg		
PMA-BS-27-10-15	2/22/2006	Octachlorobiphenyl	14	ug/Kg		
PMA-BS-27-10-15	2/22/2006	Pentachlorobiphenyl	15	ug/Kg		
PMA-BS-27-10-15	2/22/2006	Tetrachlorobiphenyl	13	ug/Kg		
		Total PCBs	221	ug/Kg		
		Total PCBs	0.221	mg/kg		

Notes:

1. Only samples with detected concentrations are shown in this table. Table 1 identifies samples with non-detect results.

Appendix A
Boring Logs

LOG OF BORING PMA-BS-1

LOG OF BORING PMA-BS-1									
Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 1/31/06 Casing Elevation: Ground Elevation:		
							DESCRIPTION	NOTES	
5	48	48	8.6			ASPHALT	ASPHALT	Fill 0-1'	
			FILL		Medium dense, dry, brownish gray sandy gravel FILL				
	7.5		CL	Medium stiff, moist, brown, low plasticity CLAY (CL)					
	8.5		SP	Medium dense, moist, brown, fine to medium grained, poorly graded SAND (SP), with silty clay					
	5.5								
10	48	48	5.1			CL	Medium stiff, brown, low plasticity silty CLAY (CL)		
			6.6						
	48	44	10.2			SM	Medium dense, brown, fine to medium grained, poorly graded silty SAND (SM), with silty clay		
15	12.6								
								Bottom of boring at 16 ft bgs Backfilled using bentonite chips	

Completion Depth: 16.00 ft bgsProject No.: 21561640Project Name: PCB Mobility & Migration InvestigationDrilling Contractor: Roberts Environmental Drilling IncorporatedDrilling method: GeoprobeLogged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

□ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler

☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-2

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 1/30/06 Casing Elevation: Ground Elevation:	
							DESCRIPTION	NOTES
5	48	32	1.2			FILL	Loose, moist, gray sandy gravel FILL	FILL 0-3.5'
			1.6				Loose, moist to wet, blackish brown, medium to coarse grained, poorly graded sand FILL, with trace gravel	
	48	36	1.9			CL	Medium stiff, moist, brownish gray, low plasticity silty CLAY (CL)	
			1.2					
10	48	42	2.5			CL		Wet @ 15'
			2.2					
	48	42	1.8			CL		
			3.0				Medium dense, wet, tan, low plasticity sandy CLAY (CL)	
15								Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgsProject No.: 21561640Project Name: PCB Mobility & Migration InvestigationDrilling Contractor: Roberts Environmental Drilling IncorporatedDrilling method: GeoprobeLogged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

☐ Water level at time of drilling☐ Water level after drilling☐ 3" Clear Acetate Liner☐ Hollow Stem Auger☐ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☐ Air Knife/Hand Auger SamplerUnified Soil Classification
based on field visual
observations.

URS

LOG OF BORING PMA-BS-3

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 1/30/06 Casing Elevation: Ground Elevation:	DESCRIPTION	NOTES
5	48	36	3.8			ASPHALT		ASPHALT	Analytical sample BS-3-01-04 Fill 0-5'
								Medium dense, dry, light gray sandy gravel FILL	
	48	42	3.0			FILL		Loose, black, fine grained sand FILL, with silt	
			2.5					BRICK FRAGMENTS	
								Medium dense, moist, dark brown, fine grained silty SAND (SM)	
10	48	48	3.8			SM			Dark brown staining
			2.0						
								Stiff, moist, gray, low plasticity CLAY (CL)	
15	48	48	6.3			CL			Sheen present Wet @ 12'
								Medium dense, wet, blackish brown, fine grained silty SAND (SM)	
			4.0			SM			
			4.9			CL		Medium stiff, moist, grayish brown sandy CLAY (CL)	Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgs
 Project No.: 21561640
 Project Name: PCB Mobility & Migration Investigation
 Drilling Contractor: Roberts Environmental Drilling Incorporated
 Drilling method: Geoprobe
 Logged by: M. Miller

Water Depth: _____ ft., After _____ hrs.
 Water Depth: _____ ft., After _____ hrs.
☒ Water level at time of drilling
☒ Water level after drilling
☒ 3" Clear Acetate Liner
☒ Hollow Stem Auger
☒ Roto Sonic-3" Core Barrel
 ATD - At time of drilling

☒ Geoprobe Macro Sampler
☒ Air Knife/Hand Auger Sampler
 Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-4

Completion
Date: 1/30/06
Casing Elevation:
Ground Elevation:

DESCRIPTION

NOTES

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
						ASPHALT	ASPHALT	
	48	38	4.4				Loose, dry, gray sandy gravel FILL	Analytical sample BS-4-01-04 Black staining
			5.0				Loose, dry, blackish brown, fine to medium grained sand FILL, with silt	
5						FILL		Fill 0-10'
	48	36	5.5					Analytical sample BS-4-05-10
			5.5				With fine gravel	
			5.5					
10	48	48				CL	Stiff, moist to wet, dark gray, low plasticity CLAY (CL)	Heavy black staining Analytical sample BS-4-10-12
			9.2					End staining
			5.7					
15	48	40				SP	Medium dense, wet, tan, fine to medium grained, poorly graded SAND (SP)	Wet @ 14.5'
			7.4					Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgs

Project No.: 21561640

Project Name: PCB Mobility & Migration Investigation

Drilling Contractor: Roberts Environmental Drilling Incorporated

Drilling method: Geoprobe

Logged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

□ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-5

							LOG OF BORING PMA-BS-5	
Depth In feet	Inches Driven	Inches Recovered	P/D (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 1/30/06 Casing Elevation: Ground Elevation:	
							DESCRIPTION	NOTES
5	48	36	3.0			FILL	Loose, moist, tan sandy gravel FILL	Fill 0-5'
			4.0					
	48	24	5.0			SC	Loose, moist, brown to reddish brown, fine to medium grained clayey SAND (SC), with trace fine gravel	
			4.8					
	10	48	48	3.7			CL	
Becomes reddish brown								
15	48	48	6.2			SP	Medium dense, moist to wet, reddish brown, fine to medium grained gravelly SAND (SP)	
			8.1					
								Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgs

Project No.: 21561640

Project Name: PCB Mobility & Migration Investigation

Drilling Contractor: Roberts Environmental Drilling Incorporated

Drilling method: Geoprobe

Logged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

▨ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler

▨ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-6

LOG OF BORING PMA-BS-6									
Depth in feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 1/30/06 Casing Elevation: Ground Elevation:		
							DESCRIPTION	NOTES	
5	48	36	18.0			FILL	Loose, moist, brownish gray sandy gravel FILL	<div>Black staining Analytical sample BS-6-02-04</div> <div>Fill 0-6'</div> <div>Black staining Analytical sample BS-6-06-10</div> <div>Analytical sample BS-6-10-15</div> <div>Wet @ 12'</div> <div>Bottom of boring at 16 ft bgs Backfilled using bentonite chips</div>	
			10.2				Medium dense, moist, black, fine to medium grained gravelly sand FILL		
	48	36	10.4			CL	Becomes gray to orange		
			13.2				Medium stiff, moist, blackish gray, low plasticity CLAY (CL) Medium dense, wet, black, fine to medium grained gravelly SAND (SP)		
	10	48	48	7.1			CL		
12.9									
13.0				GP				Loose, wet, gray sandy GRAVEL (GP)	
6.9	CL	Medium stiff, wet, gray sandy CLAY (CL)							

Completion Depth: 16.00 ft bgs

Project No.: 21561640

Project Name: PCB Mobility & Migration Investigation

Drilling Contractor: Roberts Environmental Drilling Incorporated

Drilling method: Geoprobe

Logged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

□ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler

☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-7							COMPLETION Date: 1/31/06 Casing Elevation: Ground Elevation:	DESCRIPTION	NOTES
Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS			
5	48	48	9.1			ASPHALT		ASPHALT	Fill 0-1' Analytical sample BS-7-00-05
						FILL		Medium dense, dry, grayish brown sandy gravel FILL	
5	48	48	8.1			CL		Medium stiff, moist, brown, low plasticity sandy CLAY (CL)	Analytical sample BS-7-5-10
						SP		Medium dense, moist, brownish gray, fine to medium grained, poorly graded SAND (SP)	
						CL		Medium stiff, moist, brown, low plasticity CLAY (CL)	
						SP		Medium dense, moist, brown, fine to medium grained, poorly graded SAND (SP)	
10	48	48	6.6			CL		Medium stiff, moist, brown, low plasticity silty CLAY (CL), with trace fine grained sand	Analytical sample BS-7-10-15
						SC		Medium dense, moist, brown, fine to medium grained clayey SAND (SC)	
						CL		Medium stiff, moist, brown, low plasticity CLAY (CL)	
						SP		Medium dense, moist, brown, fine to medium grained, poorly graded SAND (SP)	
15	48	48	9.2			SC		Loose to medium dense, wet, brown, fine to medium grained, poorly graded clayey SAND (SC)	Wet @ 13'
						SP		Medium stiff, wet, brownish gray, fine to medium grained, poorly graded SAND (SP)	
15			7.3						Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgs
 Project No.: 21561640
 Project Name: PCB Mobility & Migration Investigation
 Drilling Contractor: Roberts Environmental Drilling Incorporated
 Drilling method: Geoprobe
 Logged by: M. Miller

Water Depth: _____ ft., After _____ hrs.
 Water Depth: _____ ft., After _____ hrs.
☒ Water level at time of drilling
☒ Water level after drilling
☒ 3" Clear Acetate Liner
☒ Hollow Stem Auger
☒ Roto Sonic-3" Core Barrel
 ATD - At time of drilling

☒ Geoprobe Macro Sampler
☒ Air Knife/Hand Auger Sampler
 Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-8

Completion
Date: 1/31/06
Casing Elevation:
Ground Elevation:

DESCRIPTION

NOTES

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
					ASPHALT		ASPHALT	
					FILL		Medium dense, dry, gray sandy gravel FILL	
	48	42	8.5				Medium dense, moist, grayish brown, fine to medium grained, poorly graded SAND (SP), with some clay	Fill 0-1' Analytical sample BS-8-00-05
			6.8			SP		
5			10.5				Medium stiff, moist, brown, low plasticity silty CLAY (CL)	Analytical sample BS-8-05-10
	48	48	8.6			CL		
			10.7					
10	48	46	9.4			SM	Medium dense, moist to wet, brown, fine grained, poorly graded silty SAND (SM)	Analytical sample BS-8-10-15
			13.8			CL	Medium stiff, brown, low plasticity silty CLAY (CL)	
	48	48					Medium dense, moist to wet, grayish brown, fine to medium grained, poorly graded SAND (SP)	
15			9.7			SP	Becomes wet	Wet @ 15' Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgs

Project No.: 21561640

Project Name: PCB Mobility & Migration Investigation

Drilling Contractor: Roberts Environmental Drilling Incorporated

Drilling method: Geoprobe

Logged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

☒ Water level at time of drilling

☒ Water level after drilling

☒ 3" Clear Acetate Liner

☒ Hollow Stem Auger

☐ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler

☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-9

LOG OF BORING PMA-BS-9										
Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/8/06 Casing Elevation: Ground Elevation:			
							DESCRIPTION	NOTES		
5	48	30	1.4			ASPHALT	ASPHALT	Fill @ 0-1' Analytical sample BS-9-00-05		
						FILL	Medium dense, dry, light brown, poorly graded sandy gravel FILL			
						CL	Medium stiff, moist, gray, low plasticity sandy CLAY (CL)			
	3.6				SP	Medium dense, moist, gray, fine to medium grained, poorly graded SAND (SP)				
	2.5				CL	Medium stiff, moist, gray, low plasticity silty CLAY (CL)				
2.3										
10	48	42	4.0			CL	Trace fine to medium grained sand	Analytical sample BS-9-10-15		
							2.2			
							1.9			
15	48	46	7.4			SP	Medium dense, wet, gray, fine to medium grained, poorly graded SAND (SP)	Wet @ 14' Bottom of boring at 16 ft bgs Backfilled using bentonite chips		

Completion Depth: 16.00 ft bgs

Project No.: 21561640

Project Name: PCB Mobility & Migration Investigation

Drilling Contractor: Roberts Environmental Drilling Incorporated

Drilling method: Geoprobe

Logged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

□ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-10

Completion
Date: 2/8/06
Casing Elevation:
Ground Elevation:

DESCRIPTION

NOTES

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
			2.1			Fill	Medium dense, dry, brown, poorly graded sandy gravel FILL	Fill @ 0-1'
	48	44				CL	Medium stiff, moist, reddish brown, low plasticity silty CLAY (CL), with trace fine grained sand	Analytical sample BS-10-00-05
			2.8					
						SP	Medium dense, moist, brown, fine to medium grained, poorly graded SAND (SP), with trace silty clay	
5			2.9					
	48	36						
			4.9				Medium stiff, moist, grayish brown, low plasticity silty CLAY (CL)	Analytical sample BS-10-05-10
						CL		
			5.4					
10	48	40						Analytical sample BS-10-10-15
			5.5					
			7.0				Medium dense, wet, gray, fine to medium grained, poorly graded Sand (SP), with trace silty clay	Wet @ 13'
	48	40				SP		
15			9.4					
								Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgs

Project No.: 21561640

Project Name: PCB Mobility & Migration Investigation

Drilling Contractor: Roberts Environmental Drilling Incorporated

Drilling method: Geoprobe

Logged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

☒ Water level at time of drilling☐ Water level after drilling☐ 3" Clear Acetate Liner☐ Hollow Stem Auger☐ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler
☒ Air Knife/Hand Auger SamplerUnified Soil Classification
based on field visual
observations.

URS

LOG OF BORING PMA-BS-11

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/7/06 Casing Elevation: Ground Elevation:	DESCRIPTION	NOTES
5	48	36	10.2			ASPHALT		ASPHALT	Analytical sample BS-11-00-05 <i>Fill @ 0-4'</i>
			5.5			FILL		Medium dense, dry, gray, poorly graded sandy gravel FILL	
	48	44	6.8			SP		Medium stiff, reddish brown, low plasticity gravelly clay FILL	Analytical sample BS-11-05-10
			5.2					Medium dense, moist, brown to grayish brown, fine to medium grained, poorly graded SAND (SP), with silt	
10	48	32	3.3			CL		Medium stiff, moist, brown, low plasticity CLAY (CL) with silt	Analytical sample BS-11-10-15
			0.8						
			0.6						
15	48	36	0.0			CL			<i>Wet @ 16'</i> Analytical sample BS-11-15-20
			5.3					Medium stiff, moist, brown, low plasticity CLAY (CL) with silt	
	48	48	1.5			ML		Soft, wet, brown SILT (ML), with trace clay and fine grained sand	Bottom of boring at 20 ft bgs Backfilled using bentonite chips
						SP		Medium dense, wet, brown, fine to medium grained, poorly graded SAND (SP)	

Completion Depth: 20.00 ft bgsProject No.: 21561640Project Name: PCB Mobility & Migration InvestigationDrilling Contractor: Roberts Environmental Drilling IncorporatedDrilling method: GeoprobeLogged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

□ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-12

Completion
Date: 2/7/06
Casing Elevation:
Ground Elevation:

DESCRIPTION

NOTES

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
						ASPHALT	ASPHALT	
						CONCRETE	CONCRETE	
	48	36	7.3				Medium dense, dry, whitish gray, poorly graded sandy gravel FILL	Analytical sample BS-12-00-05
			2.9			FILL	Medium dense, brown, fine to medium grained, poorly graded sand FILL, with trace cinders	<i>File @ 0-9.5'</i>
5	48	48	6.3			SM	Medium dense, moist, brown, poorly graded silty SAND (SM), with sandy silt	Analytical sample BS-12-05-10
			4.2					
10	48	36	4.9			ML	Soft, moist, brown clayey SILT (ML), with trace fine grained sand	Analytical sample BS-12-10-15
			1.0					
	48	36	5.4			CL	Medium stiff, moist, brown, low plasticity silty CLAY (CL)	Analytical sample BS-12-15-20
15			6.2					
	48	42	4.9				Medium stiff, moist to wet, low plasticity sandy CLAY (CL)	
			3.3			SP	Medium dense, wet, brown, fine to medium grained, poorly graded SAND (SP)	<i>Wet @ 19'</i> Bottom of boring at 20 ft bgs Backfilled using bentonite chips

Completion Depth: 20.00 ft bgs

Project No.: 21561640

Project Name: PCB Mobility & Migration Investigation

Drilling Contractor: Roberts Environmental Drilling Incorporated

Drilling method: Geoprobe

Logged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

☐ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☑ Geoprobe Macro Sampler

☑ Air Knife/Hand Auger Sampler

Unified Soil Classification
based on field visual
observations.

URS

LOG OF BORING PMA-BS-13

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/7/06 Casing Elevation: Ground Elevation:	
							DESCRIPTION	NOTES
						CONCRETE	CONCRETE	
	48	36	1.9				Loose, whitish gray sandy gravel FILL, with wood	Analytical sample BS-13-00-05
			3.4					
5			3.0					
	48	48					Medium dense, moist, blackish brown, fine to medium grained, poorly graded sand FILL, with trace fine gravel	Black staining
			6.9					Analytical sample BS-13-06-10
			4.7			FILL		
10	48	24					Becomes moist to wet	Analytical sample BS-13-10-15
			3.9					
			5.1					
	48	36						
15			5.2					
								Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Fill @ 0-16'

Wet @ 10'

Completion Depth: 16.00 ft bgsProject No.: 21561640Project Name: PCB Mobility & Migration InvestigationDrilling Contractor: Roberts Environmental Drilling IncorporatedDrilling method: GeoprobeLogged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

Water level at time of drilling

☐ Water level after drilling☐ 3" Clear Acetate Liner☐ Hollow Stem Auger☐ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-14

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/7/06 Casing Elevation: Ground Elevation:	
							DESCRIPTION	NOTES
5	48	32	5.4			ASPHALT	ASPHALT	Analytical sample BS-14-00-05
							Medium dense, dry, brown to light brown, poorly graded sandy gravel FILL	
	48	32	6.0			FILL	Medium dense, dry, black, poorly graded gravelly sand FILL	Fill @ 0-7.5'
			4.9				Medium dense, wet, black to orange, poorly graded sandy gravel FILL	
			4.4					
10	48	48	4.2			CL	Medium stiff, wet, dark brown, low plasticity silty CLAY (CL)	Wet @ 10'
			4.9			ML	Medium stiff, wet, brown sandy SILT (ML), with trace clay	
			4.1					
15	48	48	3.7			SP	Medium dense, wet, brown, fine to medium grained, poorly graded SAND (SP)	Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgs

Project No.: 21561640

Project Name: PCB Mobility & Migration Investigation

Drilling Contractor: Roberts Environmental Drilling Incorporated

Drilling method: Geoprobe

Logged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

☒ Water level at time of drilling☐ Water level after drilling☐ 3" Clear Acetate Liner☐ Hollow Stem Auger☐ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☐ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-15

LOG OF BORING PMA-BS-15								
Depth in feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/7/06 Casing Elevation: Ground Elevation:	
							DESCRIPTION	NOTES
5	48	42	64			FILL	Medium dense, dry, light brown, poorly graded sandy gravel FILL	FILL @ 0-2'
			7.5			Medium dense, moist, brown, fine to medium grained, poorly graded sand FILL, with trace fine gravel BRICK FRAGMENTS		
	48	48	6.2		CL	Medium stiff, moist, dark brown to brown, low plasticity silty CLAY (CL), with trace fine gravel		
			4.4		SP	Medium dense, moist, brown to orangeish brown, fine to medium grained, poorly graded SAND (SP), with trace silty clay		
			6.9					
10	48	44	5.0			SP	Analytical sample BS-15-5-10	
			5.5				Analytical sample BS-15-10-15	
			6.6				Bottom of boring at 16 ft bgs Backfilled using bentonite chips	
15								

Completion Depth: 16.00 ft bgsProject No.: 21561640Project Name: PCB Mobility & Migration InvestigationDrilling Contractor: Roberts Environmental Drilling IncorporatedDrilling method: GeoprobeLogged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

□ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler

☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

Bottom of boring at 16 ft bgs
Backfilled using bentonite chips

Water Depth: _____ ft., After _____ hrs.
 Water Depth: _____ ft., After _____ hrs.
 ▼ Water level at time of drilling
 ▽ Water level after drilling
 ■ 3" Clear Acetate Liner
 ☐ Hollow Stem Auger
 □ Roto Sonic-3" Core Barrel
 ATD - At time of drilling

☒ Geoprobe Macro Sampler
 ☒ Air Knife/Hand Auger Sampler
 Unified Soil Classification based on field visual observations.

URS

LOG OF BORING
PMA-BS-17

LOG OF BORING PMA-BS-17									
Depth in feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/10/06 Casing Elevation: Ground Elevation:		
							DESCRIPTION	NOTES	
5	48	36	10.2			ASPHALT	ASPHALT	Analytical sample BS-17-02-04 Fill @ 0-4'	
			FILL			Medium dense, dry, light brown, poorly graded sandy gravel FILL			
	10.2	FILL	Medium dense, moist, dark brown to black, fine to medium grained, poorly graded sand FILL, with cinders, trace fine gravel						
	48	24	12.0			SP	Medium dense, moist, brown, fine to medium grained, poorly graded SAND (SP)		
			14.8			SP			
10	48	32	10.5			CL	Medium stiff, moist, brown, low plasticity silty CLAY (CL)		
9.0			SP			Medium dense, moist, brown, fine to medium grained, poorly graded SAND (SP), with trace silty clay			
15			48			32	5.6		
	3.9								
	13.4								
	48	40	11.9					Bottom of boring at 20 ft bgs Backfilled using bentonite chips	

Completion Depth: 20.00 ft bgs

Project No.: 21561640

Project Name: PCB Mobility & Migration Investigation

Drilling Contractor: Roberts Environmental Drilling Incorporated

Drilling method: Geoprobe

Logged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

☒ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler

☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-18

LOG OF BORING PMA-BS-18								
Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/10/06 Casing Elevation: Ground Elevation:	
DESCRIPTION							NOTES	
5	48	24	17.1			ASPHALT	ASPHALT	Fill @ 0-3'
			13.0			FILL	Medium dense, dry, gray, poorly graded sandy gravel FILL Medium stiff, moist, brown, low plasticity silty clay FILL, with wood	
	48	48	14.3			SP	Medium dense, brown, fine to medium grained, poorly graded SAND (SP), with trace silty clay	
			16.6					
	10	48	48	12.5			SP	
16.4						CL	Medium stiff, moist, brown, low plasticity silty CLAY (CL)	
15	48	48	15.8			SP	Medium dense, moist, brown, fine to medium grained, poorly graded SAND (SP) Becomes wet	Analytical sample BS-18-10-15 Wet @ 12'
			13.5					
								Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgsProject No.: 21561640Project Name: PCB Mobility & Migration InvestigationDrilling Contractor: Roberts Environmental Drilling IncorporatedDrilling method: GeoprobeLogged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

☒ Water level at time of drilling☐ Water level after drilling☐ 3" Clear Acetate Liner☐ Hollow Stem Auger☐ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☐ Air Knife/Hand Auger
SamplerUnified Soil Classification
based on field visual
observations.

URS

LOG OF BORING PMA-BS-19

Completion
Date: 2/10/06
Casing Elevation:
Ground Elevation:

DESCRIPTION

NOTES

Depth in feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
			16.8		ASPHALT	ASPHALT	ASPHALT	
	48	40			FILL	FILL	Medium dense, dry, gray, poorly graded sandy gravel FILL	Fill @ 0-2' Analytical sample BS-19-00-05
			12.1				Medium dense, moist, brown, fine to medium grained, poorly graded SAND (SP)	
5			19.6					
	48	40						Analytical sample BS-19-05-10
			9.5					
10			10.4			SP		
	48	48						Analytical sample BS-19-10-15
			8.6					
			9.7					
15	48	48					Becomes wet	Wet @ 15'
			7.4					Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgs

Project No.: 21561640

Project Name: PCB Mobility & Migration Investigation

Drilling Contractor: Roberts Environmental Drilling Incorporated

Drilling method: Geoprobe

Logged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

□ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler

☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-20

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/10/06 Casing Elevation: Ground Elevation:	NOTES
							DESCRIPTION	
5	48	36	9.4			FILL	Medium dense, dry, brownish gray, poorly graded sandy gravel FILL	Fill @ 0-6.5'
			7.8					
	48	48	9.5			FILL	Medium stiff, moist, dark brown gravelly clay FILL	
			9.3					
10	48	36	8.7			CL	Medium stiff, moist, dark gray, low plasticity CLAY (CL)	
			8.1					
	48	48	9.3			SP	Medium dense, moist, brown, fine to medium grained, poorly graded SAND (SP)	
			8.4				Becomes wet	
15								Wet @ 15'
								Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgs

Project No.: 21561640

Project Name: PCB Mobility & Migration Investigation

Drilling Contractor: Roberts Environmental Drilling Incorporated

Drilling method: Geoprobe

Logged by: M. Miller

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

Water level at time of drilling

Water level after drilling

3" Clear Acetate Liner

Hollow Stem Auger

Roto Sonic-3" Core Barrel

ATD - At time of drilling

Geoprobe Macro Sampler

Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

Water Depth: _____ ft., After _____ hrs.
 Water Depth: _____ ft., After _____ hrs.

☐ Water level at time of drilling
☐ Water level after drilling
☐ 3" Clear Acetate Liner
☐ Hollow Stem Auger
☐ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☐ Geoprobe Macro Sampler
☐ Air Knife/Hand Auger Sampler
 Unified Soil Classification based on field visual observations.

JRS (ENVIRON) LOG RAND 21561640 PCB MOBILITY.GPJ URSSTLEV.GDT 5/10/06

LOG OF BORING PMA-BS-22

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/22/06 Casing Elevation: Ground Elevation:	DESCRIPTION	NOTES
5	48	42				FILL		Dry, brown to gray, poorly graded sandy gravel FILL	Analytical sample BS-22-00-05
								Wet, grayish brown, poorly graded clayey sand FILL, with gravel	
	48	28						Wet, brown, poorly graded sandy gravel FILL	Fill @ 0-11'
								Wet, brown, poorly graded sand FILL	Analytical sample BS-22-05-10
10	48	28				SP		Wet, brown, fine to medium grained, poorly graded SAND (SP)	Wet @ 11'
	48	36							Analytical sample BS-22-10-15
15									Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgsProject No.: 21561640Project Name: PCB Mobility & Migration InvestigationDrilling Contractor: Roberts Environmental Drilling IncorporatedDrilling method: GeoprobeLogged by: M. Corbett

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

☒ Water level at time of drilling☒ Water level after drilling☒ 3" Clear Acetate Liner☒ Hollow Stem Auger☒ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☒ Air Knife/Hand Auger SamplerUnified Soil Classification
based on field visual
observations.

URS

LOG OF BORING PMA-BS-23

LOG OF BORING PMA-BS-23									
Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/22/06 Casing Elevation: Ground Elevation:		
							DESCRIPTION	NOTES	
5	48	40	10.3			FILL	Dry to moist, brown to dark brown, poorly graded sandy gravel FILL	Analytical sample BS-23-00-05	
			11.3					Fill @ 0-16'	
	48	40	11.3				Moist, brown, medium plasticity silty clay FILL with fine grained sand	Analytical sample BS-23-05-10	
			12.0				Wet, brown, fine grained, poorly graded silty sand FILL	Wet @ 7'	
10	48	42	8.6				Wet, brown, low plasticity silty clay FILL	Analytical sample BS-23-10-15	
			10.0				Wet, brown, fine to medium grained, poorly graded sand FILL		
15	48	30	8.4					Bottom of boring at 16 ft bgs Backfilled using bentonite chips	
			10.9						

Completion Depth: 16.00 ft bgsProject No.: 21561640Project Name: PCB Mobility & Migration InvestigationDrilling Contractor: Roberts Environmental Drilling IncorporatedDrilling method: GeoprobeLogged by: M. Corbett

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

□ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

Bottom of boring at 16 ft bgs
Backfilled using bentonite chips

Water Depth: _____ ft., After _____ hrs.
 Water Depth: _____ ft., After _____ hrs.

☐ Water level at time of drilling
☐ Water level after drilling
☐ 3" Clear Acetate Liner
☐ Hollow Stem Auger
☐ Roto Sonic-3" Core Barrel
 ATD - At time of drilling

☐ Geoprobe Macro Sampler
☐ Air Knife/Hand Auger Sampler
 Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-25

Depth in feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/22/06 Casing Elevation: Ground Elevation:	NOTES
							DESCRIPTION	
5	48	48	6.9			FILL	Dry, brown, poorly graded sandy gravel FILL	Analytical sample BS-25-00-05 Fill @ 0-8'
			8.4				Becomes moist, grayish brown	
	48	40	11.3				Becomes dark brown	
			9.4					
10	48	32	13.1			CH	Moist, brown, medium plasticity sandy CLAY (CH)	Wet @ 10' Analytical sample BS-25-10-15
			7.0				Wet, brownish gray, fine grained, poorly graded SAND (SP), with trace clay	
15	48	42	6.6			SP		
			9.4				Becomes medium grained, no clay	
								Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgs

Project No.: 21561640

Project Name: PCB Mobility & Migration Investigation

Drilling Contractor: Roberts Environmental Drilling Incorporated

Drilling method: Geoprobe

Logged by: M. Corbett

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

□ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler

☒ Air Knife/Hand Auger Sampler

Unified Soil Classification
based on field visual
observations.

LOG OF BORING PMA-BS-26

Completion
Date: 2/22/06
Casing Elevation:
Ground Elevation:

DESCRIPTION

NOTES

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
			2.9				Dry, brown, poorly graded sandy gravel FILL, trace silt	
	48	32					Becomes wet	Fill @ 0-5.5'
			2.4			FILL		Becomes wet at 2 ft due to draining of nearby tank
5			2.5					Analytical sample BS-26-05-10
	48	44					Moist, brownish gray, medium plasticity silty CLAY (CL)	
			2.1					
			1.6			CL		
10	48	27						
			1.7					
			2.3				Seam of wet gravelly clay	
	48	48				CL		
15			2.5					
						SP	Moist, brown, fine to medium grained, poorly graded SAND (SP), with trace silt	Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 ft bgs

Project No.: 21561640

Project Name: PCB Mobility & Migration Investigation

Drilling Contractor: Roberts Environmental Drilling Incorporated

Drilling method: Geoprobe

Logged by: M. Corbett

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

▨ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler

▨ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-BS-27

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/22/06 Casing Elevation: Ground Elevation:	NOTES
							DESCRIPTION	
5	48	24	15.7			FILL	Moist, brown, poorly graded sandy gravel FILL	Analytical sample BS-27-00-05 Fill @ 0-6'
			9.3					
10	48	32	18.8			CL	Moist, brownish gray, low plasticity silty CLAY (CL) Becomes medium plastic	Analytical sample BS-27-05-10
			18.2					
15	48	23	20.9			SP	Gray, fine to medium grained, poorly graded SAND (SP), with trace silt	Analytical sample BS-27-10-15 Bottom of boring at 16 ft bgs Backfilled using bentonite chips
			13.1					
	48	34	19.0			SP		
			9.2					

Completion Depth: 16.00 ft bgsProject No.: 21561640Project Name: PCB Mobility & Migration InvestigationDrilling Contractor: Roberts Environmental Drilling IncorporatedDrilling method: GeoprobeLogged by: M. Corbett

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

▼ Water level at time of drilling

▽ Water level after drilling

■ 3" Clear Acetate Liner

□ Hollow Stem Auger

□ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler

☒ Air Knife/Hand Auger Sampler

Unified Soil Classification
based on field visual
observations.

URS

SOLUTIA - 238



Solutia Inc.

575 Maryville Centre Drive
St. Louis, Missouri 63141

P.O. Box 66760
St. Louis, Missouri 63166-6760
Tel 314-674-1000

May 12, 2006

Mr. Kenneth Bardo
U.S EPA Region V
Corrective Action Section
Enforcement Compliance Branch
77 West Jackson Boulevard DE-J9
Chicago, IL 60604-3507

Re: Bulk Soil Sample Collection
Mass Removal Treatability Tests
W.G. Krummrich Plant

Dear Mr. Bardo,

Enclosed please find a Technical Memorandum for Bulk Soil Sample Collection for the conduct of the Mass Removal Treatability Tests at the W.G. Krummrich Facility.

If you have any questions or comment regarding the enclose report please call me at (314) 674-6768.

Sincerely,

A handwritten signature in black ink, appearing to read "Craig R. Branchfield".

Craig R. Branchfield
Manager, Remedial Projects

Bulk Soil Sample Collection
Mass Removal Treatability Tests
W.G. Krummrich Facility, Sauget, Illinois

REPORT DISTRIBUTION

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Background

In accordance with the May 2005 In-Situ Thermal Desorption (ISTD) Work Plan and the May 2005 Enhanced Aerobic Bioremediation (EABR) Work Plan, bulk soil samples were collected at known PCB and Monochlorobenzene and/or Dichlorobenzene (MCB/DCB) concentration highs in the Former PCB Manufacturing Area and the Former Chlorobenzene Process Area, respectively, at the W.G. Krummrich Facility in Sauget, Illinois. Bulk soil samples were collected to provide soil for performance of the mass removal treatability tests described in these work plans. Baseline soil samples and geotechnical soil samples were also collected as part of this work.

Soil sampling locations are summarized below and shown on **Figure 1**:

Summary of Soil Sampling Locations, Target Depths, Target Compounds and Highest Known Concentrations

<u>Sampling Locations</u>	<u>Target Sampling Depth (ft bgs)</u>	<u>Target Compound</u>	<u>Highest Known Concentration (mg/kg)</u>	<u>Selected Treatment Technology</u>
Above Water Table				
• S0825	1.5 ft bgs*	PCBs	22,100	ISTD
• DNAPL-K4	9 ft bgs	DCB	13,850	ISTD
• SCTB67	11 ft bgs	MCB	23,000	ISTD
Below Water Table				
• DNAPL-K4	16.5 ft bgs	MCB DCB	1,600 2,950	EABR
• DNAPL-K3	46.5 ft bgs	MCB DCB	570 1,962	EABR

*NOTE: The ISTD Work Plan incorrectly reported that the maximum concentration of PCBs was collected from a depth of 9.5 feet bgs at sampling location S0825; however it was discovered after the drafting of the Work Plan, that the correct depth was 1.5 feet bgs at the same location. Table 2.5 (Page 5 of 7) of the RCRA Corrective Measures Study Volume II (Solutia, 2004) and the supporting analytical data (i.e. Form 1s) are included in Appendix A.

This Tech Memo describes collection of the bulk soil samples, field baseline soil samples and geotechnical soil samples for the W.G. Krummrich Mass Removal Treatability Tests.

Bulk Soil Sample Collection

Bulk soil samples were collected between July 19 and 21, 2005 from the locations listed above and shown on **Figure 1**. A summary of each sampling location, corresponding bulk sample designation, bulk soil sample target depths, and type of bench-scale test performed on that sample is given below.

Former PCB Manufacturing Area Soil Sampling Location (Target Compound - PCBs)

○ Sampling Location S0825

This bulk soil sample, designated "Unsaturated SHU-PCB", was collected from top of soil to 3.5 feet below ground surface (bgs) and used in the ISTD bench-scale treatability testing.

Former Chlorobenzene Process Area Sampling Locations (Target Compounds - MCB and DCB)

- o Sampling Locations SCTB67 and DNAPL-K-4

The MCB portion of this bulk soil sample was collected from 9 to 13 bgs at sampling location SCTB67 and the DCB portion was collected from 7 to 11 ft bgs at sampling location DNAPL-K-4. This composite sample, which was designated "Unsaturated SHU-MCB/DCB", was collected for ISTD bench-scale treatability testing.

- o Sampling Location DNAPL-K-4

Two bulk soil samples, designated "Saturated SHU-MCB/DCB", were collected from 14.5 to 18.5 bgs at this sampling location, one for ISTD bench-scale treatability testing and the other for EABR bench-scale treatability testing.

- o Sampling Location DNAPL-K-3

One bulk soil sample was collected from 44.5 to 48.5 bgs at this sampling location and designated "Saturated MHU/DHU-MCB/DCB". This sample was used for EABR bench-scale treatability testing.

Soil samples were collected using a roto-sonic drill rig operated by Pro-Sonic Corporation of Memphis, Tennessee. At each boring location a 4-inch by 10-foot continuous sampler was advanced to a depth approximately 2 feet below the pre-determined target sampling depths. Soil from a distance of approximately 2 feet above and 2 feet below the target depth was removed from the continuous sampler by vibrating the sampler and emptying the contents into a sealed plastic sleeve. Soil was logged by a qualified URS field geologist over the sampling interval according to Unified Soil Classification Standards (USCS). The field geologist noted soil attributes such as color, particle size, consistency, moisture content, structure, plasticity, odor (if obvious) and organic content (if visible). Information from the sampling interval was recorded on field boring logs included as **Appendix B**. At the completion of each soil boring, the boreholes were backfilled with a combination of cement bentonite grout and bentonite chips.

Bulk soil samples were collected and packaged as outlined in the work plans. Soil used for the bulk samples was removed from the plastic sleeves and field homogenized prior to being placed in new and unused United Nations (UN) and Department of Transportation (DOT) approved 1-gallon, steel cans and sealed. The large volumes of soil were collected in a consistent manner from the same depth interval from multiple borings within approximately 1 to 1.5 ft from the known concentration highs. Each can was weighed and then labeled in a manner to identify the cans contents, weight, time and date of sample collection, and destination for laboratory analysis. Each can was placed in a chilled cooler and Chain of Custody documentation was completed (**Appendix C**). Bulk soil samples were transported to Kemron Environmental Services (Kemron) of Atlanta, Georgia and Groundwater Services, Inc. of Houston, TX for the homogenization and performance of the bench-scale ISTD and EABR treatability tests, respectively.

Field Baseline Soil Samples

In addition to the collection of bulk soil samples, field baseline soil samples were collected to confirm concentrations of the bulk samples shipped to the respective laboratories. The field baseline samples were collected prior to the bulk sample collection (e.g. homogenization) from the first boring completed at each sample location.

Field baseline samples were collected and packaged using procedures and protocols outlined in the FSPs and work plans. The samples were analyzed by STL-Savannah for Volatile Organic Compounds (VOCs) by USEPA Method 8260B, Semivolatile Organic Compounds (SVOCs) by USEPA Method 8270C, and Extractable Organic Halides (EOX) by USEPA Method 9023. The field baseline sample collected from the Former PCB Manufacturing Area was also analyzed for PCBs by USEPA Method 680. Field baseline soil sample Chain of Custody forms are included in **Appendix D** and the analytical data are presented in **Appendix E**. The field baseline samples represent the bulk soil samples as follows:

Former PCB Manufacturing Area Soil Sampling Location

- o Sampling Location S0825

Bulk soil sample, designated "Unsaturated SHU-PCB" is represented by field baseline sample "BS-USH-PMA-001.5".

Former Chlorobenzene Process Area Sampling Locations

- o Sampling Locations SCTB67 and DNAPL-K-4

Bulk soil sample, designated "Unsaturated SHU-MCB/DCB" is represented by field baseline samples "BS-USH-CPA-011" and "BS-USH-CPA-009" from SCTB67 and DNAPL-K-4, respectively.

- o Sampling Location DNAPL-K-4

Bulk soil sample, designated "Saturated SHU-MCB/DCB" is represented by field baseline sample "BS-SSH-CPA-016.5".

- o Sampling Location DNAPL-K-3

Bulk soil sample, designated "Saturated MHU/DHU-MCB/DCB" is represented by field baseline sample "BS-MDU-CPA-046.5".

These data were not validated because the field baseline concentrations were substantially lower than the target concentrations for the treatability studies. Consequently, these data were not used in performance of the ISTD and EABR bench-scale treatability tests.

Geotechnical Soil Samples

Geotechnical samples were collected at each sampling location on the completion of the bulk sample collection with the exception of DNAPL-K-3. A Shelby tube could not be collected at location DNAPL-K-3 due to the coarse-grained nature of the soil, so no sample was collected at this location. These samples were transported to Kemron for the following analysis: Moisture Content by ASTM D 2216, Particle Size by ASTM D 422, and Permeability by ASTM D 2434 for granular soils or ASTM D 5084 for fine grained soils. Kemron used these samples to provide physical property data to assist in the preparation of the ISTD thermal test cylinders.

Data Report

RCRA Corrective Measures Study

W.G. Krummrich Facility, Sauget, Illinois

TABLE 2.5
SOIL PCB RESULTS

Sample ID	CT-1-1-13-15	CT-1-1-13-15	CT-1-1-13-15-DUP	CT-1-2-0-2	CT-2a-1-13-15	CT-26-1-13-15	LF-1-1-18-20	LF-2-1-18-20	LF-3-1-18-20	LF-4-1-18-20
Depth	13 - 15 ft	13 - 15 ft	13 - 15 ft	0 - 2 ft	13 - 15 ft	13 - 15 ft	18 - 20 ft	18 - 20 ft	18 - 20 ft	18 - 20 ft
Sample Date	11/04/2003	11/04/2003	11/04/2003	11/04/2003	10/31/2003	11/03/2003	10/30/2003	10/29/2003	10/28/2003	10/29/2003
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Compound										
Aroclor-1268	39 U UJ	40 U		180 U UJ	73 U	210	38 U	35 U	44 U	36 U
Aroclor-1016	39 U UJ	40 U		180 U UJ	73 U	200 U	38 U	35 U	44 U	36 U
Aroclor-1221	80 U UJ	82 U		370 U UJ	150 U	400 U	78 U	72 U	89 U	74 U
Aroclor-1232	39 U UJ	40 U		180 U UJ	73 U	200 U	38 U	35 U	44 U	36 U
Aroclor-1242	39 U UJ	40 U		180 U UJ	73 U	200 U	38 U	35 U	44 U	36 U
Aroclor-1248	39 U UJ	40 U		2000 J	73 U	200 U	230 P J	35 U	44 U	36 U
Aroclor-1254	280 P J	40 U UJ		18000 D J	150	200 U	38 U	35 U	44 U	36 U
Aroclor-1260	950 J	140 J		32000 D J	240	200 U	49 J	35 U	44 U	36 U

U - Non-detect

UJ - Estimated non-detect

P - 25% difference between two columns

J - Estimated

D - Diluted

R - Rejected

*ZZ - Based on two peaks

*XX - Elevated detection limits

*YY - Peaks don't match laboratory standards.

Data Report

RCRA Corrective Measures Study
W.G. Krummrich Facility, Saugee, Illinois

TABLE 2.5
SOIL PCB RESULTS

Sample ID	S-07-15-6-8	S-07-16-1-3	S-07-18-10-12	S-07-18-14-16	S-07-19-10-12	S-07-19-10-12-DUP	S-07-20-1-3	S-08-04-1-2	S-08-06-3-4
Depth	6 - 8 ft	1 - 3 ft	10 - 12 ft	14 - 16 ft	10 - 12 ft	10 - 12 ft	1 - 3 ft	1 - 2 ft	3 - 4 ft
Sample Date	10/29/2003	10/28/2003	10/29/2003	10/29/2003	10/29/2003	10/29/2003	10/28/2003	10/27/2003	10/27/2003
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Compound									
Aroclor-1268	2100 U	860 J	990 U	400 U	16000 U	8100 U	38 U R	190000	31000
Aroclor-1016	2100 U	42 U R	990 U	400 U		8100 U	38 U R	18000 U	4000 U
Aroclor-1221	4400 U	86 U R	2000 U	810 U	16000 U	16000 U	76 U R	37000 U	8100 U
Aroclor-1232	2100 U	42 U R	990 U	400 U	8100 U	8100 U	38 U R	18000 U	4000 U
Aroclor-1242	2100 U	42 U R	10000	3000 P	8100 U	8100 U	87 J	18000 U	18000
Aroclor-1248	2100 U	42 U R	990 U	400 U	8100 U	8100 U	38 U R	130000	26000
Aroclor-1254	3000 P*ZZ	42 U R	2900	1800	8100 U	8100 U	38 U R	190000 P	26000
Aroclor-1260	30000	90 J	990 U	840	81000 U	5800 JP	38 U R	630000 D	52000 P

U - Non-detect

UJ - Estimated non-detect

P - 25% difference between two columns

J - Estimated

D - Diluted

R - Rejected

*ZZ - Based on two peaks

*XX - Elevated detection limits

*YY - Peaks don't match laboratory standards.

Data Report

RCRA Corrective Measures Study

W.G. Krummrich Facility, Sauget, Illinois

TABLE 2.5
SOIL PCB RESULTS

Sample ID Depth Sample Date Units	S-08-22-9-10 9 - 10 ft 11/03/2003 ug/kg	S-08-23-5-6 5 - 6 ft 11/04/2003 ug/kg	S-08-25-1-2 1 - 2 ft 11/04/2003 ug/kg	S-08-25-1-2-DUP 1 - 2 ft 11/04/2003 ug/kg	S-08-25-5-6 5 - 6 ft 11/04/2003 ug/kg	S-08-25-9-10 9 - 10 ft 11/04/2003 ug/kg	S-08-26-9-10 9 - 10 ft 11/05/2003 ug/kg	S-08-26-9-10-DUP 9 - 10 ft 11/05/2003 ug/kg
Compound								
Aroclor-1268	97000	88000 U	370000 U	36000 U	460 U	2400 U	88000 U	92000 U
Aroclor-1016	92000 U	88000 U	370000 U	36000 U	460 U	2400 U	88000 U	92000 U
Aroclor-1221	190000 U	180000 U	750000 U	73000 U	940 U	4800 U	180000 U	190000 U
Aroclor-1232	92000 U	88000 U	370000 U	36000 U	460 U	2400 U	88000 U	92000 U
Aroclor-1242	92000 U	88000 U	370000 U	36000 U	460 U	16000 P	140000	120000
Aroclor-1248	1000000	88000 U	370000 U UJ	5200000 D J	6200	2400 U	88000 U	92000 U
Aroclor-1254	460000	180000 P	620000 P J	8700000 D J	22000 D	97000 DP	790000	710000
Aroclor-1260	650000	750000	3200000	8200000 D	29000 D	220000 D	940000	800000

U - Non-detect

UJ - Estimated non-detect

P - 25% difference between two columns

J - Estimated

D - Diluted

R - Rejected

*ZZ - Based on two peaks

*XX - Elevated detection limits

*YY - Peaks don't match laboratory standards.

Data Report
RCRA Corrective Measures Study
W.G. Krummrich Facility, Sauget, Illinois

TABLE 2.5
SOIL PCB RESULTS

Sample ID	S-12-03-14-16	S-12-9-1-3	S-12-11-14-16
Depth	14 - 16 ft	1 - 3 ft	14 - 16 ft
Sample Date	11/05/2003	11/10/2003	11/03/2003
Units	ug/kg	ug/kg	ug/kg
Compound			
Aroclor-1268	2500 U	34 U	4300 U
Aroclor-1016	2500 U*YY	34 U	4300 U*YY
Aroclor-1221	5100 U	70 U	8700 U
Aroclor-1232	2500 U	34 U	4300 U
Aroclor-1242	2500 U	34 U	4300 U
Aroclor-1248	2500 U	34 U	4300 U
Aroclor-1254	2500 U	34 U	4300 U
Aroclor-1260	2500 U	34 U	4300 U

U - Non-detect
UJ - Estimated non-detect
P - 25% difference between two columns
J - Estimated
D - Diluted
R - Rejected
*ZZ - Based on two peaks
*XX - Elevated detection limits
*YY - Peaks don't match laboratory standards.

SDG KPS42

FORM 1 (ORGANICS)

Sample ID : 88911A*5
Date Received : 11-05-2003
Det Code / Name : PCB-8082-QV / PCB's

Client Desc : S-08-25-1-2
Client : URS CORP
Analytical Method: 8082
Matrix : Soil
Sample Wt/Vol : 30.0
Final Volume : 10.0
Percent Solids : 89
Dilution Factor : 10000
Dept : SG

SDG Number : KRM42
Date Sampled : 11-04-2003
Date Extracted: 11-17-2003
Date Analyzed : 11-21-2003
Batch ID : 1117P
Clock ID : 3K1120
Level : LOW
File ID : knv20044
Units : ug/kg dw

Cas Number	Parameter	Result	Qual
12674-11-2	Aroclor-1016	370000	U
11104-28-2	Aroclor-1221	750000	U
11141-16-5	Aroclor-1232	370000	U
53469-21-9	Aroclor-1242	370000	U
12672-29-6	Aroclor-1248	370000	U
11097-69-1	Aroclor-1254	620000	P
11096-82-5	Aroclor-1260	3200000	
11100-14-4	Aroclor 1268	370000	U

UJ
J

FORM 1 (ORGANICS)

Sample ID : 88911A*9
Date Received : 11-05-2003
Det Code / Name : PCB-8082-QV / PCB's

Client Desc : S-08-25-1-2-D
Client : URS CORP
Analytical Method: 8082
Matrix : Soil
Sample Wt/Vol : 30.0
Final Volume : 10.0
Percent Solids : 92
Dilution Factor : 1000
Dept : SG

SDG Number : KRM42
Date Sampled : 11-04-2003
Date Extracted: 11-17-2003
Date Analyzed : 12-11-2003
Batch ID : 1117P
Clock ID : 2K1211
Level : LOW
File ID : knv20047
Units : ug/kg dw

Cas Number	Parameter	Result	Qual
12674-11-2	Aroclor-1016	36000	U
11104-28-2	Aroclor-1221	73000	U
11141-16-5	Aroclor-1232	36000	U
53469-21-9	Aroclor-1242	36000	U
12672-29-6	Aroclor-1248	3700000	E
11097-69-1	Aroclor-1254	3500000	EP
11096-82-5	Aroclor-1260	5200000	E
11100-14-4	Aroclor 1268	36000	U

5'200,000 DJ
8'700,000 DJ
8'200,000 D

FORM 1 (ORGANICS)

Sample ID : 88911A*9*DL
Date Received : 11-05-2003
Det Code / Name : PCB-8082-QV / PCB's

Client Desc : S-08-25-1-2-D
Client : URS CORP
Analytical Method: 8082
Matrix : Soil
Sample Wt/Vol : 30.0
Final Volume : 10.0
Percent Solids : 92
Dilution Factor : 10000
Dept : SG

SDG Number : KRM42
Date Sampled : 11-04-2003
Date Extracted: 11-17-2003
Date Analyzed : 12-11-2003
Batch ID : 1117P
Clock ID : 2K1211
Level : LOW
File ID : knv22116
Units : ug/kg dw

don't use

Cas Number	Parameter	Result	Qual
12674-11-2	Aroclor-1016	360000	U
11104-28-2	Aroclor-1221	730000	U
11141-16-5	Aroclor-1232	360000	U
53469-21-9	Aroclor-1242	360000	U
12672-29-6	Aroclor-1248	5200000	D
11097-69-1	Aroclor-1254	8700000	D
11096-82-5	Aroclor-1260	8200000	D
11100-14-4	Aroclor 1268	360000	U

FORM 1 (ORGANICS)

Sample ID : 88911A*7
Date Received : 11-05-2003
Det Code / Name : PCB-8082-QV / PCB's

Client Desc : S-08-25-5-6
Client : URS CORP
Analytical Method: 8082
Matrix : Soil
Sample Wt/Vol : 30.0
Final Volume : 10.0
Percent Solids : 71
Dilution Factor : 10
Dept : SG

SDG Number : KRM42
Date Sampled : 11-04-2003
Date Extracted: 11-17-2003
Date Analyzed : 11-21-2003
Batch ID : 1117P
Clock ID : 3K1120
Level : LOW
File ID : knv20045
Units : ug/kg dw

Cas Number	Parameter	Result	Qual
12674-11-2	Aroclor-1016	460	U
11104-28-2	Aroclor-1221	940	U
11141-16-5	Aroclor-1232	460	U
53469-21-9	Aroclor-1242	460	U
12672-29-6	Aroclor-1248	6200	
11097-69-1	Aroclor-1254	20000	EP 22000 D
11096-82-5	Aroclor-1260	26000	EP 29,000 D
11100-14-4	Aroclor 1268	460	U

FORM 1 (ORGANICS)

Sample ID : 88911A*7*DL
 Date Received : 11-05-2003
 Det Code / Name : PCB-8082-QV / PCB's

Client Desc : S-08-25-5-6
 Client : URS CORP
 Analytical Method: 8082
 Matrix : Soil
 Sample Wt/Vol : 30.0
 Final Volume : 10.0
 Percent Solids : 71
 Dilution Factor : 40
 Dept : SG

don't use

SDG Number : KRM42
 Date Sampled : 11-04-2003
 Date Extracted: 11-17-2003
 Date Analyzed : 11-24-2003
 Batch ID : 1117P
 Clock ID : 5K1122
 Level : LOW
 File ID : knv22114
 Units : ug/kg dw

Cas Number	Parameter	Result	Qual
12674-11-2	Aroclor-1016	1800	U
11104-28-2	Aroclor-1221	3800	U
11141-16-5	Aroclor-1232	1800	U
53469-21-9	Aroclor-1242	1800	U
12672-29-6	Aroclor-1248	7200	D
11097-69-1	Aroclor-1254	22000	D
11096-82-5	Aroclor-1260	29000	D
11100-14-4	Aroclor 1268	1800	U

FORM 1 (ORGANICS)

Sample ID : 88911A*8
Date Received : 11-05-2003
Det Code / Name : PCB-8082-QV / PCB's

Client Desc : S-08-25-9-10
Client : URS CORP
Analytical Method: 8082
Matrix : Soil
Sample Wt/Vol : 30.0
Final Volume : 10.0
Percent Solids : 69
Dilution Factor : 50
Dept : SG

SDG Number : KRM42
Date Sampled : 11-04-2003
Date Extracted: 11-17-2003
Date Analyzed : 11-21-2003
Batch ID : 1117P
Clock ID : 3K1120
Level : LOW
File ID : knv20046
Units : ug/kg dw

Cas Number	Parameter	Result	Qual
12674-11-2	Aroclor-1016	2400	U
11104-28-2	Aroclor-1221	4800	U
11141-16-5	Aroclor-1232	2400	U
53469-21-9	Aroclor-1242	16000	P
12672-29-6	Aroclor-1248	2400	U
11097-69-1	Aroclor-1254	100000	E 97000 DP
11096-82-5	Aroclor-1260	150000	E 220,000 D
11100-14-4	Aroclor 1268	2400	U

FORM 1 (ORGANICS)

Sample ID : 88911A*8*DL
Date Received : 11-05-2003
Det Code / Name : PCB-8082-QV / PCB's

Client Desc : S-08-25-9-10
Client : URS CORP
Analytical Method: 8082
Matrix : Soil
Sample Wt/Vol : 30.0
Final Volume : 10.0
Percent Solids : 69
Dilution Factor : 200
Dept : SG

SDG Number : KRM42
Date Sampled : 11-04-2003
Date Extracted: 11-17-2003
Date Analyzed : 11-24-2003
Batch ID : 1117P
Clock ID : 5K1122
Level : LOW
File ID : knv22115
Units : ug/kg dw

don't use

Cas Number	Parameter	Result	Qual
12674-11-2	Aroclor-1016	9600	U
11104-28-2	Aroclor-1221	19000	U
11141-16-5	Aroclor-1232	9600	U
53469-21-9	Aroclor-1242	20000	D
12672-29-6	Aroclor-1248	9600	U
11097-69-1	Aroclor-1254	97000	DP
11096-82-5	Aroclor-1260	220000	D
11100-14-4	Aroclor 1268	9600	U

Boring Logs

LOG OF BORING

Bulk Sampling at Former S0825

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 7/21/05 Casing Elevation: Ground Elevation:	NOTES
							DESCRIPTION	
5		NA	NA			FILL	Brown, silty gravelly clay (FILL)	Collected field baseline sample designated "BS-USH-PMA-001.5" and bulk sample designated "Unsaturated SHU-PCB". Also, collected Shelby tube sample for geotechnical analysis. Concrete was present between 2 to 4' on multiple runs Wet oily gravel and cinders was present below concrete
						CONCRETE	CONCRETE	
						FILL	Dark brown to black gravel (FILL), with clay	
10							Bottom of Boring @ 6 feet bgs Backfilled borehole with hydrated bentonite chips	
15								
20								

Completion Depth: 6.00 Feet bgsProject No.: 21561573.00000Project Name: ISTD & EABR Mass Removal Treatability TestsDrilling Contractor: Pro-Sonic CorporationDrilling method: Rotosonic Drilling TechniquesLogged by: M. Corbett

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

☐ Water level at time of drilling☒ Water level after drilling☒ 3" Clear Acetate Liner☒ Hollow Stem Auger☐ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sample☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

LOG OF BORING

Bulk Sampling at Former SCTB67

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 7/20/05 Casing Elevation: Ground Elevation:	NOTES
							DESCRIPTION	
5							Soil was not logged from 0 to 10 ft bgs	Collected field baseline sample designated "BS-USH-CPA-011" and bulk sample designated "Unsaturated SHU-MCB/DCB". Also, collected Shelby tube sample for geotechnical analysis.
10						SP	Brown, fine grained SAND (SP), with some gravel	
15						CL	Soft to medium stiff, moist, brown silty CLAY (CL)	
						SC	Fine grained silty, clayey SAND (SC)	
20							Bottom of Boring at 16 feet bgs Backfilled borehole with hydrated bentonite chips	

Completion Depth: 16.00 Feet bgsProject No.: 21561573.00000Project Name: ISTD & EABR Mass Removal Treatability TestsDrilling Contractor: Pro-Sonic CorporationDrilling method: Rotosonic Drilling TechniquesLogged by: M. Corbett

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

☒ Water level at time of drilling☒ Water level after drilling☒ 3" Clear Acetate Liner☒ Hollow Stem Auger☒ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☒ Air Knife/Hand Auger SamplerUnified Soil Classification
based on field visual
observations.

URS

LOG OF BORING

Bulk Sampling at Former K4

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 7/20/05 Casing Elevation: Ground Elevation:	DESCRIPTION	NOTES
5								Soil was not logged from 0 to 6 feet bgs	
						SC		Medium dense, moist, brown silty clayey SAND (SC) with trace gravel	
10						CL		Soft, moist, dark brownish gray, low plastic silty CLAY (CL)	Collected field baseline sample designated "BS-USH-CPA-009" and bulk sample designated "Unsaturated SHU-MCB/DCB". Also, collected Shelby tube sample for geotechnical analysis.
15		NA	NA			CL		Becomes mottled with trace gravel	
20									
25						SM		Grades to silty SAND (SM)	Collected field baseline sample designated "BS-SSH-CPA-016.5" and bulk sample designated saturated "SHU-MCB/DCB". Also, collected Shelby tube sample for geotechnical analysis.
								Bottom of Boring @ 26 feet bgs Backfilled borehole with hydrated bentonite chips	

Completion Depth: 26.00 Feet bgs

Project No.: 21561573.00000

Project Name: ISTD & EABR Mass Removal Treatability Tests

Drilling Contractor: Pro-Sonic Corporation

Drilling method: Rotasonic Drilling Techniques

Logged by: M. Corbett

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

☐ Water level at time of drilling☐ Water level after drilling☐ 3" Clear Acetate Liner☐ Hollow Stem Auger☐ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sample☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

LOG OF BORING

Bulk Sampling at Former K3

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 7/19/05 Casing Elevation: Ground Elevation:	
							DESCRIPTION	NOTES
0							Not logged from 0 to 44 feet bgs	
5								
10								
15		NA	NA					
20								
25								

Completion Depth: 48.00 Feet bgsProject No.: 21561573.00000Project Name: ISTD & EABR Mass Removal Treatability TestsDrilling Contractor: Pro-Sonic CorporationDrilling method: Rotosonic Drilling TechniquesLogged by: M. Corbett

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

☐ Water level at time of drilling☐ Water level after drilling☐ 3" Clear Acetate Liner☐ Hollow Stem Auger☐ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☒ Air Knife/Hand Auger SamplerUnified Soil Classification
based on field visual
observations.

LOG OF BORING

Bulk Sampling at Former K3

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 7/19/05 Casing Elevation: Ground Elevation:	
							DESCRIPTION	NOTES
35								
40								
45						SP	Medium dense, wet, brownish gray, silty SAND (SP), with some gravel	Collected field baseline sample designated "BS-MDU-CPA-046.5" and bulk sample designated "Saturated MDU/DHU-MCB/DCB"
50							Bottom of Boring @ 48 feet bgs Backfilled borehole with bentonite / cement grout	
55								

Completion Depth: 48.00 Feet bgsProject No.: 21561573.00000Project Name: ISTD & EABR Mass Removal Treatability TestsDrilling Contractor: Pro-Sonic CorporationDrilling method: Rotosonic Drilling TechniquesLogged by: M. Corbett

Water Depth: _____ ft., After _____ hrs.

Water Depth: _____ ft., After _____ hrs.

☐ Water level at time of drilling☐ Water level after drilling☐ 3" Clear Acetate Liner☐ Hollow Stem Auger☐ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sample☐ Air Knife/Hand Auger SamplerUnified Soil Classification
based on field visual
observations.

URS

**Field Baseline and Geotechnical Sample
COCs – Kemron Environmental Services**

SHEET 1 of 1

1001 HIGHLAND PLAZA DRIVE WEST, SUITE 300
ST. LOUIS, MISSOURI 63110
314-429-0100

[illegible]

To Atlanta

1001 HIGHLAND PLAZA DRIVE WEST, SUITE 300

ST. LOUIS, MISSOURI 63110

314-429-0100

[illegible]

Shelby tubing for

Unsaturated SHU-PCB, Unsaturated SHU

1001 HIGHLAND PLAZA DRIVE WEST, SUITE 300

ST. LOUIS, MISSOURI 63110

for additional
314-429-0100

testing.

[illegible]

Field Baseline Soil Sample
COCs – Groundwater Services, Inc.

SHEET ___ of ___

1001 HIGHLAND PLAZA DRIVE WEST, SUITE 300
ST. LOUIS, MISSOURI 63110
314-429-0100

[illegible]

Chain-of-Custodies

CHAIN OF CUSTODY RECORD

URS CORPORATION

1001 HIGHLAND PLAZA DRIVE WEST, SUITE 300

ST. LOUIS, MISSOURI 63110

314-429-0100

SHEET 1 of 1

PROJECT NO: 21561573.00000		PROJECT NAME: Solutia - Krummrich ISTD		NO. OF CONTAINERS	CONTAINER DESCRIPTION / ANALYSES REQUESTED							REMARKS
SAMPLER'S: (Signature) <i>Christine Mars</i>		SAMPLE I.D. NUMBER			VOC 8260 (3.40ml Hea Vials)	SVCs 8270 (16 oz. glass)	Box 9023 (8 oz Plastic)	PCBs 680 (16 oz. glass)	Shelter 902 (Shelter 902)	Shed 902 (Shed 902)		
DATE	TIME											
		BS-USH-PMA-001.5										
7/20/05	13:45	BS-USH-CPA-011		3	1	2	0					
7/20/05	9:00	BS-USH-CPA-009		3	1	2	0					
		BS-SSH-CPA-011.5										
7/20/05	17:45	BS-USH-CPA-011-EB		4	2	0	4				The bottles are for an equipment blank.	
7/21/05	8:00	BS-USH-PMA-001.5		3	1	2	1					
7/21/05	8:00	BS-USH-PMA-001.5-AD		3	1	2	1					
7/21/05	8:00	BS-USH-PMA-001.5-US		3	1	2	1					
7/21/05	8:00	BS-USH-PMA-001.5-MD		3	1	2	1					
RELINQUISHED BY: (Signature) <i>Christine Mars</i>		DATE / TIME 7/21/05 13:45		RECEIVED BY: (Signature) <i>Christine Mars</i>		DATE / TIME 7-21-05 1347						
RELINQUISHED BY: (Signature)		DATE / TIME		RECEIVED BY: (Signature)		DATE / TIME						
METHOD OF SHIPMENT:				AIRBILL NO:		6029-010						

URS CORPORATION

314-429-0100

SHEET

[illegible]

CHAIN OF CUSTODY RECORD

URS CORPORATION

1001 HIGHLAND PLAZA DRIVE WEST, SUITE 300
ST. LOUIS, MISSOURI 63110
314-429-0100

SHEET 1 of 1

PROJECT NO: 21561573.00000		PROJECT NAME: Solutia - Krummich ISTD		NO. OF CONTAINERS	CONTAINER DESCRIPTION / ANALYSES REQUESTED						REMARKS
SAMPLER'S: (Signature) <i>Christine Mays</i>		SAMPLE I.D. NUMBER			VOC 8260 (3.40ml Headspace)	SIVCS 8270 (16 oz glass)	Fox 9023 (8 oz Plastic)	PCBS 680 (16 oz glass)	Butyl 9023 (16 oz glass)	Shutby 9023 (16 oz glass)	
DATE	TIME										
		BS-USH-PMA-001.5									
7/20/05	13:45	BS-USH-CPA-011		3	1	2	0				
7/20/05	9:00	BS-USH-CPA-009		3	1	2	0				
		BS-SSH-CPA-011.5									
7/20/05	14:45	BS-USH-CPA-011-EB		4	2	0	4			The bottles are for an equipment blank.	
7/21/05	8:00	BS-USH-PMA-001.5		3	1	2	1				
7/21/05	8:00	BS-USH-PMA-001.5-AD		3	1	2	1				
7/21/05	8:00	BS-USH-PMA-001.5-US		3	1	2	1				
7/21/05	8:00	BS-USH-PMA-001.5-MD		3	1	2	1				
RELINQUISHED BY: (Signature) <i>Christine Mays</i>		DATE / TIME 7/21/05 13:47		RECEIVED BY: (Signature) <i>[Signature]</i>		DATE / TIME 7-21-05 1347					
RELINQUISHED BY: (Signature)		DATE / TIME		RECEIVED AT LAB BY: (Signature)		DATE / TIME					
METHOD		EQUIPMENT		AIRBILL NO.							

3029-1111

SHEET 1 OF 1

URS CORPORATION

1001 HIGHLAND PLAZA DRIVE WEST, SUITE 300

ST. LOUIS, MISSOURI 63110

314-429-0100

[illegible]

BS-USH-PMA-001.5

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-PMA-001.5

Lab Sample ID: 680-6203-4

Date Sampled: 07/21/2005 0800

Client Matrix: Solid

% Moisture: 20

Date Received: 07/22/2005 1314

8260B Volatile Organic Compounds by GC/MS

Method: 8260B

Analysis Batch: 680-17616

Instrument ID: GC/MS Volatiles - M

Preparation: 5035-Medium

Prep Batch: 680-16962

Lab File ID: m0031.d

Dilution: 1.0

Initial Weight/Volume: 7.1 g

Date Analyzed: 07/30/2005 0246

Final Weight/Volume: 5 mL

Date Prepared: 07/25/2005 1113

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Acetone		1800	U	1800
Benzene		180	U	180
Bromodichloromethane		180	U	180
Bromoform		180	U	180
Bromomethane		180	U	180
2-Butanone (MEK)		880	U	880
Carbon disulfide		180	U	180
Carbon tetrachloride		180	U	180
Chlorobenzene		180	U	180
Chloroethane		180	U	180
Chloroform		180	U	180
Chloromethane		180	U*	180
cis-1,2-Dichloroethene		180	U	180
cis-1,3-Dichloropropene		180	U	180
Dibromochloromethane		180	U	180
1,1-Dichloroethane		180	U	180
1,2-Dichloroethane		180	U	180
1,1-Dichloroethene		180	U	180
1,2-Dichloropropane		180	U	180
Ethylbenzene		180	U	180
2-Hexanone		880	U	880
Methylene Chloride		180	U	180
4-Methyl-2-pentanone (MIBK)		880	U	880
Styrene		180	U	180
1,1,2,2-Tetrachloroethane		180	U	180
Tetrachloroethene		180	U	180
Toluene		4300		180
trans-1,2-Dichloroethene		180	U	180
trans-1,3-Dichloropropene		180	U	180
1,1,1-Trichloroethane		180	U	180
1,1,2-Trichloroethane		180	U	180
Trichloroethene		180	U	180
Vinyl chloride		180	U*	180
Xylenes, Total		350	U	350

Surrogate	%Rec	Acceptance Limits
4-Bromofluorobenzene	84	68 - 121
Dibromofluoromethane	89	66 - 127
Toluene-d8	82	65 - 128

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-PMA-001.5

Lab Sample ID: 680-6203-4

Date Sampled: 07/21/2005 0800

Client Matrix: Solid

% Moisture: 20

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method: 8270C

Analysis Batch: 680-17475

Instrument ID: GC/MS SemiVolatiles - T

Preparation: 3550B

Prep Batch: 680-17081

Lab File ID: t0278.d

Dilution: 10

Initial Weight/Volume: 30.02 g

Date Analyzed: 07/29/2005 0720

Final Weight/Volume: 10.0 mL

Date Prepared: 07/26/2005 1018

Injection Volume:

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Acenaphthene		41000	U	41000
Acenaphthylene		41000	U	41000
Anthracene		41000	U	41000
Benzo[a]anthracene		41000	U	41000
Benzo[a]pyrene		41000	U	41000
Benzo[b]fluoranthene		41000	U	41000
Benzo[g,h,i]perylene		41000	U	41000
Benzo[k]fluoranthene		41000	U	41000
Bis(2-chloroethoxy)methane		41000	U	41000
Bis(2-chloroethyl)ether		41000	U	41000
Bis(2-ethylhexyl) phthalate		41000	U	41000
4-Bromophenyl phenyl ether		41000	U	41000
Butyl benzyl phthalate		41000	U	41000
Carbazole		41000	U	41000
4-Chloroaniline		83000	U	83000
4-Chloro-3-methylphenol		41000	U	41000
2-Chloronaphthalene		41000	U	41000
2-Chlorophenol		41000	U	41000
4-Chlorophenyl phenyl ether		41000	U	41000
Chrysene		41000	U	41000
Dibenz(a,h)anthracene		41000	U	41000
Dibenzofuran		41000	U	41000
1,3-Dichlorobenzene		41000	U	41000
1,4-Dichlorobenzene		41000	U	41000
1,2-Dichlorobenzene		41000	U	41000
3,3'-Dichlorobenzidine		83000	U	83000
2,4-Dichlorophenol		41000	U	41000
Diethyl phthalate		41000	U	41000
2,4-Dimethylphenol		41000	U	41000
Dimethyl phthalate		41000	U	41000
Di-n-butyl phthalate		41000	U	41000
4,6-Dinitro-2-methylphenol		210000	U	210000
2,4-Dinitrophenol		210000	U	210000
2,4-Dinitrotoluene		41000	U	41000
2,6-Dinitrotoluene		41000	U	41000
Di-n-octyl phthalate		41000	U	41000
Fluoranthene		41000	U	41000
Fluorene		41000	U	41000
Hexachlorobenzene		41000	U	41000
Hexachlorobutadiene		41000	U	41000
Hexachlorocyclopentadiene		41000	U	41000
Hexachloroethane		41000	U	41000
Indeno[1,2,3-cd]pyrene		41000	U	41000

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-PMA-001.5

Lab Sample ID: 680-6203-4

Date Sampled: 07/21/2005 0800

Client Matrix: Solid

% Moisture: 20

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method:	8270C	Analysis Batch: 680-17475	Instrument ID: GC/MS SemiVolatiles - T
Preparation:	3550B	Prep Batch: 680-17081	Lab File ID: t0278.d
Dilution:	10		Initial Weight/Volume: 30.02 g
Date Analyzed:	07/29/2005 0720		Final Weight/Volume: 10.0 mL
Date Prepared:	07/26/2005 1018		Injection Volume:

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Isophorone		41000	U	41000
2-Methylnaphthalene		41000	U	41000
2-Methylphenol		41000	U	41000
3 & 4 Methylphenol		41000	U	41000
Naphthalene		41000	U	41000
2-Nitroaniline		210000	U	210000
3-Nitroaniline		210000	U	210000
4-Nitroaniline		210000	U	210000
Nitrobenzene		41000	U	41000
2-Nitrophenol		41000	U	41000
4-Nitrophenol		210000	U	210000
N-Nitrosodi-n-propylamine		41000	U	41000
N-Nitrosodiphenylamine		41000	U	41000
2,2'-oxybis(2-chloropropane)		41000	U	41000
Pentachlorophenol		210000	U	210000
Phenanthrene		41000	U	41000
Phenol		41000	U	41000
Pyrene		41000	U	41000
1,2,4-Trichlorobenzene		41000	U	41000
2,4,6-Trichlorophenol		41000	U	41000
2,4,5-Trichlorophenol		41000	U	41000

Surrogate	%Rec		Acceptance Limits
Phenol-d5	0	*	38 - 102
2-Fluorophenol	0	*	36 - 101
2,4,6-Tribromophenol	0	*	27 - 124
Nitrobenzene-d5	0	*	33 - 94
2-Fluorobiphenyl	0	*	38 - 104
Terphenyl-d14	0	*	40 - 129

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-PMA-001.5

Lab Sample ID: 680-6203-4

Client Matrix: Solid

Date Sampled: 07/21/2005 0800

Date Received: 07/22/2005 1314

680 Polychlorinated Biphenyls by GCMS

Method: 680

Analysis Batch: 680-20117

Instrument ID: GC/MS SemiVolatiles - F

Preparation: 680_P_Solid

Prep Batch: 680-17808

Lab File ID: N/A

Dilution: 100

Initial Weight/Volume: 30.00 g

Date Analyzed: 08/07/2005 1427

Final Weight/Volume: 1.0 mL

Date Prepared: 08/02/2005 1441

Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Heptachlorobiphenyl		360000	E	1000
Hexachlorobiphenyl		400000	E	670
Nonachlorobiphenyl		37000		1700
Octachlorobiphenyl		170000	E	1000
Monochlorobiphenyl		330	U	330
DCB Decachlorobiphenyl		8600		1700
Dichlorobiphenyl		5900		330
Pentachlorobiphenyl		490000	E	670
Tetrachlorobiphenyl		430000	E	670
Trichlorobiphenyl		53000	E	330
Surrogate		%Rec		Acceptance Limits
Decachlorobiphenyl-13C12		0	D	30 - 130

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-PMA-001.5

Lab Sample ID: 680-6203-4

Client Matrix: Solid

Date Sampled: 07/21/2005 0800

Date Received: 07/22/2005 1314

680 Polychlorinated Biphenyls by GCMS

Method: 680

Analysis Batch: 680-20117

Instrument ID: GC/MS SemiVolatiles - F

Preparation: 680_P_Solid

Prep Batch: 680-17808

Lab File ID: N/A

Dilution: 500

Initial Weight/Volume: 30.00 g

Date Analyzed: 08/05/2005 1218

Run Type: DL

Final Weight/Volume: 1.0 mL

Date Prepared: 08/02/2005 1441

Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Heptachlorobiphenyl		210000	D	5000
Hexachlorobiphenyl		230000	D	3400
Nonachlorobiphenyl		22000	D	8500
Octachlorobiphenyl		100000	D	5000
Monochlorobiphenyl		1700	U	1700
DCB Decachlorobiphenyl		8500	U	8500
Dichlorobiphenyl		3500	D	1700
Pentachlorobiphenyl		280000	D	3400
Tetrachlorobiphenyl		240000	D	3400
Trichlorobiphenyl		42000	D	1700
Surrogate		%Rec		Acceptance Limits
Decachlorobiphenyl-13C12		0	D	30 - 130

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

General Chemistry**Client Sample ID: BS-USH-PMA-001.5**

Lab Sample ID: 680-6203-4

Client Matrix: Solid

% Moisture: 20

Date Sampled: 07/21/2005 0800

Date Received: 07/22/2005 1314

Analyte	Result	Qual	Units	RL	Dil	Method
Halogens, Extractable Organic	23000		mg/Kg	130	10	9023
Any Batch: 680-18067 Date Analyzed 08/03/2005 1300						DryWt Corrected: Y

Analyte	Result	Qual	Units	RL	Dil	Method
Percent Moisture	20		%	1.0	1.0	160.3
Any Batch: 680-16959 Date Analyzed 07/25/2005 1056						

Percent Solids	80		%	1.0	1.0	160.3
Any Batch: 680-16959 Date Analyzed 07/25/2005 1056						

Client Sample ID: BS-USH-PMA-001.5-AD

Lab Sample ID: 680-6203-5

Client Matrix: Solid

% Moisture: 21

Date Sampled: 07/21/2005 0800

Date Received: 07/22/2005 1314

Analyte	Result	Qual	Units	RL	Dil	Method
Halogens, Extractable Organic	1100		mg/Kg	13	1.0	9023
Any Batch: 680-18067 Date Analyzed 08/03/2005 1300						DryWt Corrected: Y

Analyte	Result	Qual	Units	RL	Dil	Method
Percent Moisture	21		%	1.0	1.0	160.3
Any Batch: 680-16959 Date Analyzed 07/25/2005 1056						

Percent Solids	79		%	1.0	1.0	160.3
Any Batch: 680-16959 Date Analyzed 07/25/2005 1056						

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-PMA-001.5-AD

Lab Sample ID: 680-6203-5

Date Sampled: 07/21/2005 0800

Client Matrix: Solid

% Moisture: 21

Date Received: 07/22/2005 1314

8260B Volatile Organic Compounds by GC/MS

Method: 8260B

Analysis Batch: 680-17616

Instrument ID: GC/MS Volatiles - M

Preparation: 5035-Medium

Prep Batch: 680-16962

Lab File ID: m0032.d

Dilution: 1.0

Initial Weight/Volume: 6.3 g

Date Analyzed: 07/30/2005 0306

Final Weight/Volume: 5 mL

Date Prepared: 07/25/2005 1113

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Acetone		10000	U	10000
Benzene		1000	U	1000
Bromodichloromethane		1000	U	1000
Bromoform		1000	U	1000
Bromomethane		1000	U	1000
2-Butanone (MEK)		5000	U	5000
Carbon disulfide		1000	U	1000
Carbon tetrachloride		1000	U	1000
Chlorobenzene		1000	U	1000
Chloroethane		1000	U	1000
Chloroform		1000	U	1000
Chloromethane		1000	U*	1000
cis-1,2-Dichloroethene		1000	U	1000
cis-1,3-Dichloropropene		1000	U	1000
Dibromochloromethane		1000	U	1000
1,1-Dichloroethane		1000	U	1000
1,2-Dichloroethane		1000	U	1000
1,1-Dichloroethene		1000	U	1000
1,2-Dichloropropane		1000	U	1000
Ethylbenzene		1000	U	1000
2-Hexanone		5000	U	5000
Methylene Chloride		1000	U	1000
4-Methyl-2-pentanone (MIBK)		5000	U	5000
Styrene		1000	U	1000
1,1,2,2-Tetrachloroethane		1000	U	1000
Tetrachloroethene		1800		1000
Toluene		27000		1000
trans-1,2-Dichloroethene		1000	U	1000
trans-1,3-Dichloropropene		1000	U	1000
1,1,1-Trichloroethane		1000	U	1000
1,1,2-Trichloroethane		1000	U	1000
Trichloroethene		1000	U	1000
Vinyl chloride		1000	U*	1000
Xylenes, Total		2000	U	2000

Surrogate	%Rec	Acceptance Limits
4-Bromofluorobenzene	71	68 - 121
Dibromofluoromethane	75	66 - 127
Toluene-d8	68	65 - 128

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-PMA-001.5-AD

Lab Sample ID: 680-6203-5

Client Matrix: Solid

Date Sampled: 07/21/2005 0800

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method:	8270C	Analysis Batch: 680-17373	Instrument ID: GC/MS SemiVolatiles - T
Preparation:	3550B	Prep Batch: 680-17081	Lab File ID: t0228.d
Dilution:	10		Initial Weight/Volume: 30.04 g
Date Analyzed:	07/27/2005 1621		Final Weight/Volume: 10.0 mL
Date Prepared:	07/26/2005 1018		Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Acenaphthene		33000	U	33000
Acenaphthylene		33000	U	33000
Anthracene		33000	U	33000
Benzo[a]anthracene		33000	U	33000
Benzo[a]pyrene		33000	U	33000
Benzo[b]fluoranthene		33000	U	33000
Benzo[g,h,i]perylene		33000	U	33000
Benzo[k]fluoranthene		33000	U	33000
Bis(2-chloroethoxy)methane		33000	U	33000
Bis(2-chloroethyl)ether		33000	U	33000
Bis(2-ethylhexyl) phthalate		33000	U	33000
4-Bromophenyl phenyl ether		33000	U	33000
Butyl benzyl phthalate		33000	U	33000
Carbazole		33000	U	33000
4-Chloroaniline		66000	U	66000
4-Chloro-3-methylphenol		33000	U	33000
2-Chloronaphthalene		33000	U	33000
2-Chlorophenol		33000	U	33000
4-Chlorophenyl phenyl ether		33000	U	33000
Chrysene		33000	U	33000
Dibenz(a,h)anthracene		33000	U	33000
Dibenzofuran		33000	U	33000
1,3-Dichlorobenzene		33000	U	33000
1,4-Dichlorobenzene		33000	U	33000
1,2-Dichlorobenzene		33000	U	33000
3,3'-Dichlorobenzidine		66000	U	66000
2,4-Dichlorophenol		33000	U	33000
Diethyl phthalate		33000	U	33000
2,4-Dimethylphenol		33000	U	33000
Dimethyl phthalate		33000	U	33000
Di-n-butyl phthalate		33000	U	33000
4,6-Dinitro-2-methylphenol		170000	U	170000
2,4-Dinitrophenol		170000	U	170000
2,4-Dinitrotoluene		33000	U	33000
2,6-Dinitrotoluene		33000	U	33000
Di-n-octyl phthalate		33000	U	33000
Fluoranthene		33000	U	33000
Fluorene		33000	U	33000
Hexachlorobenzene		33000	U	33000
Hexachlorobutadiene		33000	U	33000
Hexachlorocyclopentadiene		33000	U	33000
Hexachloroethane		33000	U	33000
Indeno[1,2,3-cd]pyrene		33000	U	33000

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-PMA-001.5-AD

Lab Sample ID: 680-6203-5

Date Sampled: 07/21/2005 0800

Client Matrix: Solid

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method:	8270C	Analysis Batch: 680-17373	Instrument ID: GC/MS SemiVolatiles - T
Preparation:	3550B	Prep Batch: 680-17081	Lab File ID: t0228.d
Dilution:	10		Initial Weight/Volume: 30.04 g
Date Analyzed:	07/27/2005 1621		Final Weight/Volume: 10.0 mL
Date Prepared:	07/26/2005 1018		Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Isophorone		33000	U	33000
2-Methylnaphthalene		33000	U	33000
2-Methylphenol		33000	U	33000
3 & 4 Methylphenol		33000	U	33000
Naphthalene		33000	U	33000
2-Nitroaniline		170000	U	170000
3-Nitroaniline		170000	U	170000
4-Nitroaniline		170000	U	170000
Nitrobenzene		33000	U	33000
2-Nitrophenol		33000	U	33000
4-Nitrophenol		170000	U	170000
N-Nitrosodi-n-propylamine		33000	U	33000
N-Nitrosodiphenylamine		33000	U	33000
2,2'-oxybis(2-chloropropane)		33000	U	33000
Pentachlorophenol		170000	U	170000
Phenanthrene		33000	U	33000
Phenol		33000	U	33000
Pyrene		33000	U	33000
1,2,4-Trichlorobenzene		33000	U	33000
2,4,6-Trichlorophenol		33000	U	33000
2,4,5-Trichlorophenol		33000	U	33000

Surrogate	%Rec	Acceptance Limits
Phenol-d5	23	38 - 102
2-Fluorophenol	0	36 - 101
2,4,6-Tribromophenol	0	27 - 124
Nitrobenzene-d5	0	33 - 94
2-Fluorobiphenyl	0	38 - 104
Terphenyl-d14	0	40 - 129

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-PMA-001.5-AD

Lab Sample ID: 680-6203-5

Client Matrix: Solid

Date Sampled: 07/21/2005 0800

Date Received: 07/22/2005 1314

680 Polychlorinated Biphenyls by GCMS

Method: 680
Preparation: 680_P_Solid
Dilution: 100
Date Analyzed: 08/05/2005 0922
Date Prepared: 08/02/2005 1441

Analysis Batch: 680-20117
Prep Batch: 680-17808

Instrument ID: GC/MS SemiVolatiles - F
Lab File ID: N/A
Initial Weight/Volume: 30.04 g
Final Weight/Volume: 1.0 mL
Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Heptachlorobiphenyl		110000		1000
Hexachlorobiphenyl		130000		670
Nonachlorobiphenyl		11000		1700
Octachlorobiphenyl		45000		1000
Monochlorobiphenyl		330	U	330
DCB Decachlorobiphenyl		3700		1700
Dichlorobiphenyl		5200		330
Pentachlorobiphenyl		94000		670
Tetrachlorobiphenyl		68000		670
Trichlorobiphenyl		10000		330
Surrogate		%Rec		Acceptance Limits
Decachlorobiphenyl-13C12		0	D	30 - 130

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-PMA-001.5-AD

Lab Sample ID: 680-6203-5

Date Sampled: 07/21/2005 0800

Client Matrix: Solid

Date Received: 07/22/2005 1314

680 Polychlorinated Biphenyls by GCMS

Method:	680	Analysis Batch:	680-20117	Instrument ID:	GC/MS SemiVolatiles - F
Preparation:	680_P_Solid	Prep Batch:	680-17808	Lab File ID:	N/A
Dilution:	500			Initial Weight/Volume:	30.04 g
Date Analyzed:	08/05/2005 0922	Run Type:	DL	Final Weight/Volume:	1.0 mL
Date Prepared:	08/02/2005 1441			Injection Volume:	

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Heptachlorobiphenyl		55000	D	5000
Hexachlorobiphenyl		66000	D	3300
Nonachlorobiphenyl		8500	U	8500
Octachlorobiphenyl		22000	D	5000
Monochlorobiphenyl		1600	U	1600
DCB Decachlorobiphenyl		8500	U	8500
Dichlorobiphenyl		2000	D	1600
Pentachlorobiphenyl		50000	D	3300
Tetrachlorobiphenyl		34000	D	3300
Trichlorobiphenyl		4500	D	1600
Surrogate		%Rec		Acceptance Limits
Decachlorobiphenyl-13C12		0	D	30 - 130

BS-USH-CPA-009

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-CPA-009

Lab Sample ID: 680-6203-2

Date Sampled: 07/20/2005 0900

Client Matrix: Solid

% Moisture: 27

Date Received: 07/22/2005 1314

8260B Volatile Organic Compounds by GC/MS

Method: 8260B

Analysis Batch: 680-17616

Instrument ID: GC/MS Volatiles - M

Preparation: 5035-Medium

Prep Batch: 680-16962

Lab File ID: m0030.d

Dilution: 1.0

Initial Weight/Volume: 7.2 g

Date Analyzed: 07/30/2005 0225

Final Weight/Volume: 5 mL

Date Prepared: 07/25/2005 1113

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Acetone		19000	U	19000
Benzene		1900	U	1900
Bromodichloromethane		1900	U	1900
Bromoform		1900	U	1900
Bromomethane		1900	U	1900
2-Butanone (MEK)		9500	U	9500
Carbon disulfide		1900	U	1900
Carbon tetrachloride		1900	U	1900
Chlorobenzene		35000		1900
Chloroethane		1900	U	1900
Chloroform		1900	U	1900
Chloromethane		1900	U*	1900
cis-1,2-Dichloroethene		1900	U	1900
cis-1,3-Dichloropropene		1900	U	1900
Dibromochloromethane		1900	U	1900
1,1-Dichloroethane		1900	U	1900
1,2-Dichloroethane		1900	U	1900
1,1-Dichloroethene		1900	U	1900
1,2-Dichloropropane		1900	U	1900
Ethylbenzene		1900	U	1900
2-Hexanone		9500	U	9500
Methylene Chloride		1900	U	1900
4-Methyl-2-pentanone (MIBK)		9500	U	9500
Styrene		1900	U	1900
1,1,2,2-Tetrachloroethane		1900	U	1900
Tetrachloroethene		1900	U	1900
Toluene		1900	U	1900
trans-1,2-Dichloroethene		1900	U	1900
trans-1,3-Dichloropropene		1900	U	1900
1,1,1-Trichloroethane		1900	U	1900
1,1,2-Trichloroethane		1900	U	1900
Trichloroethene		1900	U	1900
Vinyl chloride		1900	U*	1900
Xylenes, Total		3800	U	3800

Surrogate	%Rec	Acceptance Limits
4-Bromofluorobenzene	0	68 - 121
Dibromofluoromethane	0	66 - 127
Toluene-d8	0	65 - 128

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-CPA-009

Lab Sample ID: 680-6203-2

Client Matrix: Solid

% Moisture: 27

Date Sampled: 07/20/2005 0900

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method: 8270C

Analysis Batch: 680-17475

Instrument ID: GC/MS SemiVolatiles - T

Preparation: 3550B

Prep Batch: 680-17081

Lab File ID: t0276.d

Dilution: 2.0

Initial Weight/Volume: 30.01 g

Date Analyzed: 07/29/2005 0626

Final Weight/Volume: 1.0 mL

Date Prepared: 07/26/2005 1018

Injection Volume:

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Acenaphthene		900	U	900
Acenaphthylene		900	U	900
Anthracene		900	U	900
Benzo[a]anthracene		900	U	900
Benzo[a]pyrene		900	U	900
Benzo[b]fluoranthene		900	U	900
Benzo[g,h,i]perylene		900	U	900
Benzo[k]fluoranthene		900	U	900
Bis(2-chloroethoxy)methane		900	U	900
Bis(2-chloroethyl)ether		900	U	900
Bis(2-ethylhexyl) phthalate		900	U	900
4-Bromophenyl phenyl ether		900	U	900
Butyl benzyl phthalate		900	U	900
Carbazole		900	U	900
4-Chloroaniline		9100		1800
4-Chloro-3-methylphenol		900	U	900
2-Chloronaphthalene		900	U	900
2-Chlorophenol		900	U	900
4-Chlorophenyl phenyl ether		900	U	900
Chrysene		900	U	900
Dibenz(a,h)anthracene		900	U	900
Dibenzofuran		900	U	900
1,3-Dichlorobenzene		900	U	900
1,4-Dichlorobenzene		1700		900
1,2-Dichlorobenzene		2300		900
3,3'-Dichlorobenzidine		1800	U	1800
2,4-Dichlorophenol		900	U	900
Diethyl phthalate		900	U	900
2,4-Dimethylphenol		900	U	900
Dimethyl phthalate		900	U	900
Di-n-butyl phthalate		900	U	900
4,6-Dinitro-2-methylphenol		4600	U	4600
2,4-Dinitrophenol		4600	U	4600
2,4-Dinitrotoluene		900	U	900
2,6-Dinitrotoluene		900	U	900
Di-n-octyl phthalate		900	U	900
Fluoranthene		900	U	900
Fluorene		900	U	900
Hexachlorobenzene		900	U	900
Hexachlorobutadiene		900	U	900
Hexachlorocyclopentadiene		900	U	900
Hexachloroethane		900	U	900
Indeno[1,2,3-cd]pyrene		900	U	900

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-CPA-009

Lab Sample ID: 680-6203-2

Date Sampled: 07/20/2005 0900

Client Matrix: Solid % Moisture: 27

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method:	8270C	Analysis Batch: 680-17475	Instrument ID:	GC/MS SemiVolatiles - T
Preparation:	3550B	Prep Batch: 680-17081	Lab File ID:	t0276.d
Dilution:	2.0		Initial Weight/Volume:	30.01 g
Date Analyzed:	07/29/2005 0626		Final Weight/Volume:	1.0 mL
Date Prepared:	07/26/2005 1018		Injection Volume:	

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Isophorone		900	U	900
2-Methylnaphthalene		900	U	900
2-Methylphenol		900	U	900
3 & 4 Methylphenol		900	U	900
Naphthalene		900	U	900
2-Nitroaniline		4600	U	4600
3-Nitroaniline		4600	U	4600
4-Nitroaniline		4600	U	4600
Nitrobenzene		2900		900
2-Nitrophenol		900	U	900
4-Nitrophenol		4600	U	4600
N-Nitrosodi-n-propylamine		900	U	900
N-Nitrosodiphenylamine		900	U	900
2,2'-oxybis(2-chloropropane)		900	U	900
Pentachlorophenol		4600	U	4600
Phenanthrene		900	U	900
Phenol		900	U	900
Pyrene		900	U	900
1,2,4-Trichlorobenzene		900	U	900
2,4,6-Trichlorophenol		900	U	900
2,4,5-Trichlorophenol		900	U	900

Surrogate	%Rec	Acceptance Limits
Phenol-d5	50	38 - 102
2-Fluorophenol	47	36 - 101
2,4,6-Tribromophenol	57	27 - 124
Nitrobenzene-d5	45	33 - 94
2-Fluorobiphenyl	58	38 - 104
Terphenyl-d14	59	40 - 129

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

General Chemistry

Client Sample ID: BS-USH-CPA-011

Lab Sample ID: 680-6203-1

Client Matrix: Solid

% Moisture: 25

Date Sampled: 07/20/2005 1345

Date Received: 07/22/2005 1314

Analyte	Result	Qual	Units	RL	Dil	Method
Halogens, Extractable Organic	42		mg/Kg	13	1.0	9023
Any Batch: 680-18067 Date Analyzed 08/03/2005 1300						DryWt Corrected: Y

Analyte	Result	Qual	Units	RL	Dil	Method
Percent Moisture	25		%	1.0	1.0	160.3
Any Batch: 680-16959 Date Analyzed 07/25/2005 1056						

Percent Solids	75		%	1.0	1.0	160.3
Any Batch: 680-16959 Date Analyzed 07/25/2005 1056						

Client Sample ID: BS-USH-CPA-009

Lab Sample ID: 680-6203-2

Client Matrix: Solid

% Moisture: 27

Date Sampled: 07/20/2005 0900

Date Received: 07/22/2005 1314

Analyte	Result	Qual	Units	RL	Dil	Method
Halogens, Extractable Organic	52		mg/Kg	14	1.0	9023
Any Batch: 680-18067 Date Analyzed 08/03/2005 1300						DryWt Corrected: Y

Analyte	Result	Qual	Units	RL	Dil	Method
Percent Solids	73		%	1.0	1.0	160.3
Any Batch: 680-16959 Date Analyzed 07/25/2005 1056						

Percent Moisture	27		%	1.0	1.0	160.3
Any Batch: 680-16959 Date Analyzed 07/25/2005 1056						

BS-USH-CPA-011

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-CPA-011

Lab Sample ID: 680-6203-1

Client Matrix: Solid

% Moisture: 25

Date Sampled: 07/20/2005 1345

Date Received: 07/22/2005 1314

8260B Volatile Organic Compounds by GC/MS

Method: 8260B

Analysis Batch: 680-17616

Instrument ID: GC/MS Volatiles - M

Preparation: 5035-Medium

Prep Batch: 680-16962

Lab File ID: m0029.d

Dilution: 1.0

Initial Weight/Volume: 6.4 g

Date Analyzed: 07/30/2005 0205

Final Weight/Volume: 5 mL

Date Prepared: 07/25/2005 1113

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Acetone		52000	U	52000
Benzene		5200	U	5200
Bromodichloromethane		5200	U	5200
Bromoform		5200	U	5200
Bromomethane		5200	U	5200
2-Butanone (MEK)		26000	U	26000
Carbon disulfide		5200	U	5200
Carbon tetrachloride		5200	U	5200
Chlorobenzene		160000		5200
Chloroethane		5200	U	5200
Chloroform		5200	U	5200
Chloromethane		5200	U*	5200
cis-1,2-Dichloroethene		5200	U	5200
cis-1,3-Dichloropropene		5200	U	5200
Dibromochloromethane		5200	U	5200
1,1-Dichloroethane		5200	U	5200
1,2-Dichloroethane		5200	U	5200
1,1-Dichloroethene		5200	U	5200
1,2-Dichloropropane		5200	U	5200
Ethylbenzene		5200	U	5200
2-Hexanone		26000	U	26000
Methylene Chloride		5200	U	5200
4-Methyl-2-pentanone (MIBK)		26000	U	26000
Styrene		5200	U	5200
1,1,2,2-Tetrachloroethane		5200	U	5200
Tetrachloroethene		5200	U	5200
Toluene		5200	U	5200
trans-1,2-Dichloroethene		5200	U	5200
trans-1,3-Dichloropropene		5200	U	5200
1,1,1-Trichloroethane		5200	U	5200
1,1,2-Trichloroethane		5200	U	5200
Trichloroethene		5200	U	5200
Vinyl chloride		5200	U*	5200
Xylenes, Total		10000	U	10000
Surrogate	%Rec			Acceptance Limits
4-Bromofluorobenzene	0	*		68 - 121
Dibromofluoromethane	0	*		66 - 127
Toluene-d8	0	*		65 - 128

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1
Sdg Number: KRM47

Client Sample ID: BS-USH-CPA-011

Lab Sample ID: 680-6203-1

Date Sampled: 07/20/2005 1345

Client Matrix: Solid

% Moisture: 25

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method: 8270C

Analysis Batch: 680-17373

Instrument ID: GC/MS SemiVolatiles - T

Preparation: 3550B

Prep Batch: 680-17081

Lab File ID: t0225.d

Dilution: 1.0

Initial Weight/Volume: 30.05 g

Date Analyzed: 07/27/2005 1457

Final Weight/Volume: 1.0 mL

Date Prepared: 07/26/2005 1018

Injection Volume:

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Acenaphthene		440	U	440
Acenaphthylene		440	U	440
Anthracene		440	U	440
Benzo[a]anthracene		440	U	440
Benzo[a]pyrene		440	U	440
Benzo[b]fluoranthene		440	U	440
Benzo[g,h,i]perylene		440	U	440
Benzo[k]fluoranthene		440	U	440
Bis(2-chloroethoxy)methane		440	U	440
Bis(2-chloroethyl)ether		440	U	440
Bis(2-ethylhexyl) phthalate		440	U	440
4-Bromophenyl phenyl ether		440	U	440
Butyl benzyl phthalate		440	U	440
Carbazole		440	U	440
4-Chloroaniline		880	U	880
4-Chloro-3-methylphenol		440	U	440
2-Chloronaphthalene		440	U	440
2-Chlorophenol		440	U	440
4-Chlorophenyl phenyl ether		440	U	440
Chrysene		440	U	440
Dibenz(a,h)anthracene		440	U	440
Dibenzofuran		440	U	440
1,3-Dichlorobenzene		440	U	440
1,4-Dichlorobenzene		850		440
1,2-Dichlorobenzene		700		440
3,3'-Dichlorobenzidine		880	U	880
2,4-Dichlorophenol		440	U	440
Diethyl phthalate		440	U	440
2,4-Dimethylphenol		440	U	440
Dimethyl phthalate		440	U	440
Di-n-butyl phthalate		440	U	440
4,6-Dinitro-2-methylphenol		2300	U	2300
2,4-Dinitrophenol		2300	U	2300
2,4-Dinitrotoluene		440	U	440
2,6-Dinitrotoluene		440	U	440
Di-n-octyl phthalate		440	U	440
Fluoranthene		440	U	440
Fluorene		440	U	440
Hexachlorobenzene		440	U	440
Hexachlorobutadiene		440	U	440
Hexachlorocyclopentadiene		440	U	440
Hexachloroethane		440	U	440
Indeno[1,2,3-cd]pyrene		440	U	440

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-CPA-011

Lab Sample ID: 680-6203-1

Date Sampled: 07/20/2005 1345

Client Matrix: Solid

% Moisture: 25

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method: 8270C

Analysis Batch: 680-17373

Instrument ID: GC/MS SemiVolatiles - T

Preparation: 3550B

Prep Batch: 680-17081

Lab File ID: t0225.d

Dilution: 1.0

Initial Weight/Volume: 30.05 g

Date Analyzed: 07/27/2005 1457

Final Weight/Volume: 1.0 mL

Date Prepared: 07/26/2005 1018

Injection Volume:

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Isophorone		440	U	440
2-Methylnaphthalene		440	U	440
2-Methylphenol		440	U	440
3 & 4 Methylphenol		440	U	440
Naphthalene		440	U	440
2-Nitroaniline		2300	U	2300
3-Nitroaniline		2300	U	2300
4-Nitroaniline		2300	U	2300
Nitrobenzene		440	U	440
2-Nitrophenol		440	U	440
4-Nitrophenol		2300	U	2300
N-Nitrosodi-n-propylamine		440	U	440
N-Nitrosodiphenylamine		440	U	440
2,2'-oxybis(2-chloropropane)		440	U	440
Pentachlorophenol		2300	U	2300
Phenanthrene		440	U	440
Phenol		440	U	440
Pyrene		440	U	440
1,2,4-Trichlorobenzene		440	U	440
2,4,6-Trichlorophenol		440	U	440
2,4,5-Trichlorophenol		440	U	440

Surrogate	%Rec	Acceptance Limits
Phenol-d5	45	38 - 102
2-Fluorophenol	43	36 - 101
2,4,6-Tribromophenol	74	27 - 124
Nitrobenzene-d5	39	33 - 94
2-Fluorobiphenyl	51	38 - 104
Terphenyl-d14	61	40 - 129

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-CPA-011-EB

Lab Sample ID: 680-6203-3EB

Date Sampled: 07/20/2005 1445

Client Matrix: Water

Date Received: 07/22/2005 1314

8260B Volatile Organic Compounds by GC/MS

Method: 8260B

Analysis Batch: 680-17851

Instrument ID: GC/MS Volatiles - A

Preparation: 5030B

Lab File ID: a7177.d

Dilution: 1.0

Initial Weight/Volume: 5 mL

Date Analyzed: 08/01/2005 1421

Final Weight/Volume: 5 mL

Date Prepared: 08/01/2005 1421

Analyte	Result (ug/L)	Qualifier	RL
Acetone	25	U	25
Benzene	1.0	U	1.0
Bromodichloromethane	1.0	U	1.0
Bromoform	1.0	U	1.0
Bromomethane	1.0	U	1.0
2-Butanone (MEK)	10	U	10
Carbon disulfide	1.0	U	1.0
Carbon tetrachloride	1.0	U	1.0
Chlorobenzene	1.0	U	1.0
Chloroethane	1.0	U	1.0
Chloroform	1.0	U	1.0
Chloromethane	1.0	U	1.0
cis-1,2-Dichloroethene	1.0	U	1.0
cis-1,3-Dichloropropene	1.0	U	1.0
Dibromochloromethane	1.0	U	1.0
1,1-Dichloroethane	1.0	U	1.0
1,2-Dichloroethane	1.0	U	1.0
1,1-Dichloroethene	1.0	U	1.0
1,2-Dichloropropane	1.0	U	1.0
Ethylbenzene	1.0	U	1.0
2-Hexanone	10	U	10
Methylene Chloride	5.0	U	5.0
4-Methyl-2-pentanone (MIBK)	10	U	10
Styrene	1.0	U	1.0
1,1,2,2-Tetrachloroethane	1.0	U	1.0
Tetrachloroethene	1.0	U	1.0
Toluene	1.1		1.0
trans-1,2-Dichloroethene	1.0	U	1.0
trans-1,3-Dichloropropene	1.0	U	1.0
1,1,1-Trichloroethane	1.0	U	1.0
1,1,2-Trichloroethane	1.0	U	1.0
Trichloroethene	1.0	U	1.0
Vinyl chloride	1.0	U	1.0
Xylenes, Total	2.0	U	2.0

Surrogate	%Rec	Acceptance Limits
4-Bromofluorobenzene	94	77 - 120
Dibromofluoromethane	105	75 - 123
Toluene-d8	101	79 - 122

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-CPA-011-EB

Lab Sample ID: 680-6203-3EB

Client Matrix: Water

Date Sampled: 07/20/2005 1445

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method:	8270C	Analysis Batch: 680-17747	Instrument ID:	GC/MS SemiVolatiles
Preparation:	3520C	Prep Batch: 680-17025	Lab File ID:	j2520.d
Dilution:	1.0		Initial Weight/Volume:	1040 mL
Date Analyzed:	07/30/2005 1727		Final Weight/Volume:	1 mL
Date Prepared:	07/25/2005 1719		Injection Volume:	

Analyte	Result (ug/L)	Qualifier	RL
Acenaphthene	9.6	U	9.6
Acenaphthylene	9.6	U	9.6
Anthracene	9.6	U	9.6
Benzo[a]anthracene	9.6	U	9.6
Benzo[a]pyrene	9.6	U	9.6
Benzo[b]fluoranthene	9.6	U	9.6
Benzo[g,h,i]perylene	9.6	U	9.6
Benzo[k]fluoranthene	9.6	U	9.6
Bis(2-chloroethoxy)methane	9.6	U	9.6
Bis(2-chloroethyl)ether	9.6	U	9.6
Bis(2-ethylhexyl) phthalate	9.6	U	9.6
4-Bromophenyl phenyl ether	9.6	U	9.6
Butyl benzyl phthalate	9.6	U	9.6
Carbazole	9.6	U	9.6
4-Chloroaniline	19	U*	19
4-Chloro-3-methylphenol	9.6	U	9.6
2-Chloronaphthalene	9.6	U	9.6
2-Chlorophenol	9.6	U	9.6
4-Chlorophenyl phenyl ether	9.6	U	9.6
Chrysene	9.6	U	9.6
Dibenz(a,h)anthracene	9.6	U	9.6
Dibenzofuran	9.6	U	9.6
1,3-Dichlorobenzene	9.6	U	9.6
1,4-Dichlorobenzene	9.6	U	9.6
1,2-Dichlorobenzene	9.6	U	9.6
3,3'-Dichlorobenzidine	19	U*	19
2,4-Dichlorophenol	9.6	U	9.6
Diethyl phthalate	9.6	U	9.6
2,4-Dimethylphenol	9.6	U	9.6
Dimethyl phthalate	9.6	U	9.6
Di-n-butyl phthalate	9.6	U	9.6
4,6-Dinitro-2-methylphenol	48	U	48
2,4-Dinitrophenol	48	U	48
2,4-Dinitrotoluene	9.6	U	9.6
2,6-Dinitrotoluene	9.6	U	9.6
Di-n-octyl phthalate	9.6	U	9.6
Fluoranthene	9.6	U	9.6
Fluorene	9.6	U	9.6
Hexachlorobenzene	9.6	U	9.6
Hexachlorobutadiene	9.6	U	9.6
Hexachlorocyclopentadiene	9.6	U	9.6
Hexachloroethane	9.6	U	9.6
Indeno[1,2,3-cd]pyrene	9.6	U	9.6

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-CPA-011-EB

Lab Sample ID: 680-6203-3EB

Date Sampled: 07/20/2005 1445

Client Matrix: Water

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method: 8270C	Analysis Batch: 680-17747	Instrument ID: GC/MS SemiVolatiles
Preparation: 3520C	Prep Batch: 680-17025	Lab File ID: j2520.d
Dilution: 1.0		Initial Weight/Volume: 1040 mL
Date Analyzed: 07/30/2005 1727		Final Weight/Volume: 1 mL
Date Prepared: 07/25/2005 1719		Injection Volume:

Analyte	Result (ug/L)	Qualifier	RL
Isophorone	9.6	U	9.6
2-Methylnaphthalene	9.6	U	9.6
2-Methylphenol	9.6	U	9.6
3 & 4 Methylphenol	9.6	U	9.6
Naphthalene	9.6	U	9.6
2-Nitroaniline	48	U	48
3-Nitroaniline	48	U	48
4-Nitroaniline	48	U	48
Nitrobenzene	9.6	U	9.6
2-Nitrophenol	9.6	U	9.6
4-Nitrophenol	48	U	48
N-Nitrosodi-n-propylamine	9.6	U	9.6
N-Nitrosodiphenylamine	9.6	U	9.6
2,2'-oxybis(2-chloropropane)	9.6	U	9.6
Pentachlorophenol	48	U	48
Phenanthrene	9.6	U	9.6
Phenol	9.6	U	9.6
Pyrene	9.6	U	9.6
1,2,4-Trichlorobenzene	9.6	U	9.6
2,4,6-Trichlorophenol	9.6	U	9.6
2,4,5-Trichlorophenol	9.6	U	9.6

Surrogate	%Rec	Acceptance Limits
Phenol-d5	90	55 - 104
2-Fluorophenol	92	56 - 100
2,4,6-Tribromophenol	112	55 - 126
Nitrobenzene-d5	96	60 - 102
2-Fluorobiphenyl	105	59 - 103
Terphenyl-d14	112	10 - 154

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-USH-CPA-011-EB

Lab Sample ID: 680-6203-3EB

Client Matrix: Water

Date Sampled: 07/20/2005 1445

Date Received: 07/22/2005 1314

680 Polychlorinated Biphenyls by GCMS

Method: 680
Preparation: 680_P_Liquid
Dilution: 1.0
Date Analyzed: 08/01/2005 1632
Date Prepared: 07/27/2005 1720

Analysis Batch: 680-20207
Prep Batch: 680-17300

Instrument ID: GC/MS SemiVolatiles - F
Lab File ID: N/A
Initial Weight/Volume: 1060 mL
Final Weight/Volume: 1 mL
Injection Volume:

Analyte	Result (ug/L)	Qualifier	RL
Heptachlorobiphenyl	0.28	U	0.28
Hexachlorobiphenyl	0.19	U	0.19
Nonachlorobiphenyl	0.47	U	0.47
Octachlorobiphenyl	0.28	U	0.28
Monochlorobiphenyl	0.094	U	0.094
DCB Decachlorobiphenyl	0.47	U	0.47
Dichlorobiphenyl	0.094	U	0.094
Pentachlorobiphenyl	0.19	U	0.19
Tetrachlorobiphenyl	0.19	U	0.19
Trichlorobiphenyl	0.094	U	0.094
Surrogate	%Rec	Acceptance Limits	
Decachlorobiphenyl-13C12	93	44 - 104	

BS-SSH-CPA-016.5

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-SSH-CPA-016.5

Lab Sample ID: 680-6203-8

Client Matrix: Solid

% Moisture:

Date Sampled: 07/20/2005 1050

Date Received: 07/22/2005 1314

8260B Volatile Organic Compounds by GC/MS

Method: 8260B
Preparation: 5035-Medium
Dilution: 1.0
Date Analyzed: 07/30/2005 0408
Date Prepared: 07/25/2005 1113

Analysis Batch: 680-17616
Prep Batch: 680-16962

Instrument ID: GC/MS Volatiles - M
Lab File ID: m0035.d
Initial Weight/Volume: 6.2 g
Final Weight/Volume: 5 mL

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Acetone		57000	U	57000
Benzene		5700	U	5700
Bromodichloromethane		5700	U	5700
Bromoform		5700	U	5700
Bromomethane		5700	U	5700
2-Butanone (MEK)		28000	U	28000
Carbon disulfide		5700	U	5700
Carbon tetrachloride		5700	U	5700
Chlorobenzene		110000		5700
Chloroethane		5700	U	5700
Chloroform		5700	U	5700
Chloromethane		5700	U*	5700
cis-1,2-Dichloroethene		5700	U	5700
cis-1,3-Dichloropropene		5700	U	5700
Dibromochloromethane		5700	U	5700
1,1-Dichloroethane		5700	U	5700
1,2-Dichloroethane		5700	U	5700
1,1-Dichloroethene		5700	U	5700
1,2-Dichloropropane		5700	U	5700
Ethylbenzene		5700	U	5700
2-Hexanone		28000	U	28000
Methylene Chloride		5700	U	5700
4-Methyl-2-pentanone (MIBK)		28000	U	28000
Styrene		5700	U	5700
1,1,2,2-Tetrachloroethane		5700	U	5700
Tetrachloroethene		5700	U	5700
Toluene		5700	U	5700
trans-1,2-Dichloroethene		5700	U	5700
trans-1,3-Dichloropropene		5700	U	5700
1,1,1-Trichloroethane		5700	U	5700
1,1,2-Trichloroethane		5700	U	5700
Trichloroethene		5700	U	5700
Vinyl chloride		5700	U*	5700
Xylenes, Total		11000	U	11000
Surrogate	%Rec			Acceptance Limits
4-Bromofluorobenzene	0	*		68 - 121
Dibromofluoromethane	0	*		66 - 127
Toluene-d8	0	*		65 - 128

Analytical Data

Client: URS Corporation

Job Number: 680-6203-3

Sdg Number: KRM47

Client Sample ID: BS-SSH-CPA-016.5

Lab Sample ID: 680-6203-8

Date Sampled: 07/20/2005 1050

Client Matrix: Solid

% Moisture: 29

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method: 8270C

Analysis Batch: 680-17475

Instrument ID: GC/MS SemiVolatiles - T

Preparation: 3550B

Prep Batch: 680-17081

Lab File ID: t0262.d

Dilution: 10

Initial Weight/Volume: 30.01 g

Date Analyzed: 07/29/2005 0008

Final Weight/Volume: 1.0 mL

Date Prepared: 07/26/2005 1018

Injection Volume:

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Acenaphthene		4700	U	4700
Acenaphthylene		4700	U	4700
Anthracene		4700	U	4700
Benzo[a]anthracene		4700	U	4700
Benzo[a]pyrene		4700	U	4700
Benzo[b]fluoranthene		4700	U	4700
Benzo[g,h,i]perylene		4700	U	4700
Benzo[k]fluoranthene		4700	U	4700
Bis(2-chloroethoxy)methane		4700	U	4700
Bis(2-chloroethyl)ether		4700	U	4700
Bis(2-ethylhexyl) phthalate		4700	U	4700
4-Bromophenyl phenyl ether		4700	U	4700
Butyl benzyl phthalate		4700	U	4700
Carbazole		4700	U	4700
4-Chloroaniline		9300	U	9300
4-Chloro-3-methylphenol		4700	U	4700
2-Chloronaphthalene		4700	U	4700
2-Chlorophenol		4700	U	4700
4-Chlorophenyl phenyl ether		4700	U	4700
Chrysene		4700	U	4700
Dibenz(a,h)anthracene		4700	U	4700
Dibenzofuran		4700	U	4700
1,3-Dichlorobenzene		4700	U	4700
1,4-Dichlorobenzene		4700	U	4700
1,2-Dichlorobenzene		4700	U	4700
3,3'-Dichlorobenzidine		9300	U	9300
2,4-Dichlorophenol		4700	U	4700
Diethyl phthalate		4700	U	4700
2,4-Dimethylphenol		4700	U	4700
Dimethyl phthalate		4700	U	4700
Di-n-butyl phthalate		4700	U	4700
4,6-Dinitro-2-methylphenol		24000	U	24000
2,4-Dinitrophenol		24000	U	24000
2,4-Dinitrotoluene		4700	U	4700
2,6-Dinitrotoluene		4700	U	4700
Di-n-octyl phthalate		4700	U	4700
Fluoranthene		4700	U	4700
Fluorene		4700	U	4700
Hexachlorobenzene		4700	U	4700
Hexachlorobutadiene		4700	U	4700
Hexachlorocyclopentadiene		4700	U	4700
Hexachloroethane		4700	U	4700
Indeno[1,2,3-cd]pyrene		4700	U	4700

Analytical Data

Client: URS Corporation

Job Number: 680-6203-3

Sdg Number: KRM47

Client Sample ID: BS-SSH-CPA-016.5

Lab Sample ID: 680-6203-8

Client Matrix: Solid

% Moisture: 29

Date Sampled: 07/20/2005 1050

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method:	8270C	Analysis Batch: 680-17475	Instrument ID: GC/MS SemiVolatiles - T
Preparation:	3550B	Prep Batch: 680-17081	Lab File ID: t0262.d
Dilution:	10		Initial Weight/Volume: 30.01 g
Date Analyzed:	07/29/2005 0008		Final Weight/Volume: 1.0 mL
Date Prepared:	07/26/2005 1018		Injection Volume:

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Isophorone		4700	U	4700
2-Methylnaphthalene		4700	U	4700
2-Methylphenol		4700	U	4700
3 & 4 Methylphenol		4700	U	4700
Naphthalene		4700	U	4700
2-Nitroaniline		24000	U	24000
3-Nitroaniline		24000	U	24000
4-Nitroaniline		24000	U	24000
Nitrobenzene		4700	U	4700
2-Nitrophenol		4700	U	4700
4-Nitrophenol		24000	U	24000
N-Nitrosodi-n-propylamine		4700	U	4700
N-Nitrosodiphenylamine		4700	U	4700
2,2'-oxybis(2-chloropropane)		4700	U	4700
Pentachlorophenol		24000	U	24000
Phenanthrene		4700	U	4700
Phenol		4700	U	4700
Pyrene		4700	U	4700
1,2,4-Trichlorobenzene		4700	U	4700
2,4,6-Trichlorophenol		4700	U	4700
2,4,5-Trichlorophenol		4700	U	4700

Surrogate	%Rec	Acceptance Limits
Phenol-d5	0	38 - 102
2-Fluorophenol	0	36 - 101
2,4,6-Tribromophenol	0	27 - 124
Nitrobenzene-d5	0	33 - 94
2-Fluorobiphenyl	0	38 - 104
Terphenyl-d14	0	40 - 129

Analytical Data

Client: URS Corporation

Job Number: 680-6203-3

Sdg Number: KRM47

General Chemistry

Client Sample ID: BS-SSH-CPA-016.5

Lab Sample ID: 680-6203-8

Date Sampled: 07/20/2005 1050

Client Matrix: Solid

% Moisture: 29

Date Received: 07/22/2005 1314

Analyte	Result	Qual	Units	RL	Dil	Method
Halogens, Extractable Organic	430		mg/Kg	14	1.0	9023
Any Batch: 680-18067 Date Analyzed 08/03/2005 1300					DryWt Corrected: Y	

Analyte	Result	Qual	Units	RL	Dil	Method
Percent Moisture	29		%	1.0	1.0	160.3
Any Batch: 680-16959 Date Analyzed 07/25/2005 1056						

Percent Solids	71		%	1.0	1.0	160.3
Any Batch: 680-16959 Date Analyzed 07/25/2005 1056						

Client Sample ID: BS-MDU-CPA-046.5

Lab Sample ID: 680-6203-9

Date Sampled: 07/19/2005 1315

Client Matrix: Solid

% Moisture: 18

Date Received: 07/22/2005 1314

Analyte	Result	Qual	Units	RL	Dil	Method
Halogens, Extractable Organic	6300		mg/Kg	12	1.0	9023
Any Batch: 680-18067 Date Analyzed 08/03/2005 1300					DryWt Corrected: Y	

Analyte	Result	Qual	Units	RL	Dil	Method
Percent Moisture	18		%	1.0	1.0	160.3
Any Batch: 680-16959 Date Analyzed 07/25/2005 1056						

Percent Solids	82		%	1.0	1.0	160.3
Any Batch: 680-16959 Date Analyzed 07/25/2005 1056						

BS-MDU-CPA-046.5

Analytical Data

Client: URS Corporation

Job Number: 680-6203-1

Sdg Number: KRM47

Client Sample ID: BS-MDU-CPA-046.5

Lab Sample ID: 680-6203-9

Date Sampled: 07/19/2005 1315

Client Matrix: Solid

% Moisture:

Date Received: 07/22/2005 1314

8260B Volatile Organic Compounds by GC/MS

Method: 8260B

Analysis Batch: 680-17616

Instrument ID: GC/MS Volatiles - M

Preparation: 5035-Medium

Prep Batch: 680-16962

Lab File ID: m0036.d

Dilution: 1.0

Initial Weight/Volume: 6.0 g

Date Analyzed: 07/30/2005 0428

Final Weight/Volume: 5 mL

Date Prepared: 07/25/2005 1113

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Acetone		100000	U	100000
Benzene		17000		10000
Bromodichloromethane		10000	U	10000
Bromoform		10000	U	10000
Bromomethane		10000	U	10000
2-Butanone (MEK)		51000	U	51000
Carbon disulfide		10000	U	10000
Carbon tetrachloride		10000	U	10000
Chlorobenzene		360000		10000
Chloroethane		10000	U	10000
Chloroform		10000	U	10000
Chloromethane		10000	U*	10000
cis-1,2-Dichloroethene		10000	U	10000
cis-1,3-Dichloropropene		10000	U	10000
Dibromochloromethane		10000	U	10000
1,1-Dichloroethane		10000	U	10000
1,2-Dichloroethane		10000	U	10000
1,1-Dichloroethene		10000	U	10000
1,2-Dichloropropane		10000	U	10000
Ethylbenzene		10000	U	10000
2-Hexanone		51000	U	51000
Methylene Chloride		10000	U	10000
4-Methyl-2-pentanone (MIBK)		51000	U	51000
Styrene		10000	U	10000
1,1,2,2-Tetrachloroethane		10000	U	10000
Tetrachloroethene		10000	U	10000
Toluene		10000	U	10000
trans-1,2-Dichloroethene		10000	U	10000
trans-1,3-Dichloropropene		10000	U	10000
1,1,1-Trichloroethane		10000	U	10000
1,1,2-Trichloroethane		10000	U	10000
Trichloroethene		10000	U	10000
Vinyl chloride		10000	U*	10000
Xylenes, Total		20000	U	20000

Surrogate	%Rec	Acceptance Limits
4-Bromofluorobenzene	0	68 - 121
Dibromofluoromethane	0	66 - 127
Toluene-d8	0	65 - 128

Analytical Data

Client: URS Corporation

Job Number: 680-6203-3

Sdg Number: KRM47

Client Sample ID: BS-MDU-CPA-046.5

Lab Sample ID: 680-6203-9

Client Matrix: Solid

% Moisture: 18

Date Sampled: 07/19/2005 1315

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method:	8270C	Analysis Batch: 680-17475	Instrument ID:	GC/MS Semivolatiles - T
Preparation:	3550B	Prep Batch: 680-17081	Lab File ID:	t0277.d
Dilution:	2.0		Initial Weight/Volume:	30.01 g
Date Analyzed:	07/29/2005 0653		Final Weight/Volume:	1.0 mL
Date Prepared:	07/26/2005 1018		Injection Volume:	

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Acenaphthene		810	U	810
Acenaphthylene		810	U	810
Anthracene		810	U	810
Benzo[a]anthracene		810	U	810
Benzo[a]pyrene		810	U	810
Benzo[b]fluoranthene		810	U	810
Benzo[g,h,i]perylene		810	U	810
Benzo[k]fluoranthene		810	U	810
Bis(2-chloroethoxy)methane		810	U	810
Bis(2-chloroethyl)ether		810	U	810
Bis(2-ethylhexyl) phthalate		810	U	810
4-Bromophenyl phenyl ether		810	U	810
Butyl benzyl phthalate		810	U	810
Carbazole		810	U	810
4-Chloroaniline		1600	U	1600
4-Chloro-3-methylphenol		810	U	810
2-Chloronaphthalene		810	U	810
2-Chlorophenol		810	U	810
4-Chlorophenyl phenyl ether		810	U	810
Chrysene		810	U	810
Dibenz(a,h)anthracene		810	U	810
Dibenzofuran		810	U	810
1,3-Dichlorobenzene		940		810
1,4-Dichlorobenzene		7100		810
1,2-Dichlorobenzene		11000		810
3,3'-Dichlorobenzidine		1600	U	1600
2,4-Dichlorophenol		810	U	810
Diethyl phthalate		810	U	810
2,4-Dimethylphenol		810	U	810
Dimethyl phthalate		810	U	810
Di-n-butyl phthalate		810	U	810
4,6-Dinitro-2-methylphenol		4200	U	4200
2,4-Dinitrophenol		4200	U	4200
2,4-Dinitrotoluene		810	U	810
2,6-Dinitrotoluene		810	U	810
Di-n-octyl phthalate		810	U	810
Fluoranthene		810	U	810
Fluorene		810	U	810
Hexachlorobenzene		810	U	810
Hexachlorobutadiene		810	U	810
Hexachlorocyclopentadiene		810	U	810
Hexachloroethane		810	U	810
Indeno[1,2,3-cd]pyrene		810	U	810

Analytical Data

Client: URS Corporation

Job Number: 680-6203-3

Sdg Number: KRM47

Client Sample ID: BS-MDU-CPA-046.5

Lab Sample ID: 680-6203-9

Date Sampled: 07/19/2005 1315

Client Matrix: Solid

% Moisture: 18

Date Received: 07/22/2005 1314

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method: 8270C

Analysis Batch: 680-17475

Instrument ID: GC/MS SemiVolatiles - T

Preparation: 3550B

Prep Batch: 680-17081

Lab File ID: t0277.d

Dilution: 2.0

Initial Weight/Volume: 30.01 g

Date Analyzed: 07/29/2005 0653

Final Weight/Volume: 1.0 mL

Date Prepared: 07/26/2005 1018

Injection Volume:

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Isophorone		810	U	810
2-Methylnaphthalene		810	U	810
2-Methylphenol		810	U	810
3 & 4 Methylphenol		810	U	810
Naphthalene		810	U	810
2-Nitroaniline		4200	U	4200
3-Nitroaniline		4200	U	4200
4-Nitroaniline		4200	U	4200
Nitrobenzene		810	U	810
2-Nitrophenol		810	U	810
4-Nitrophenol		4200	U	4200
N-Nitrosodi-n-propylamine		810	U	810
N-Nitrosodiphenylamine		810	U	810
2,2'-oxybis(2-chloropropane)		810	U	810
Pentachlorophenol		4200	U	4200
Phenanthrene		810	U	810
Phenol		810	U	810
Pyrene		810	U	810
1,2,4-Trichlorobenzene		2400		810
2,4,6-Trichlorophenol		810	U	810
2,4,5-Trichlorophenol		810	U	810

Surrogate	%Rec	Acceptance Limits
Phenol-d5	48	38 - 102
2-Fluorophenol	46	36 - 101
2,4,6-Tribromophenol	49	27 - 124
Nitrobenzene-d5	42	33 - 94
2-Fluorobiphenyl	55	38 - 104
Terphenyl-d14	59	40 - 129

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Kenneth
Bardo/R5/USEPA/US
05/22/2006 02:40 PM

To crbran1@solutia.com
cc Steve Johnson/R5/USEPA/US@EPA
bcc


Subject PCB Mobility and Migration Investigation

Craig - We reviewed the May 5, 2006 Tech Memo titled "Phase II Site Investigation, PCB Mobility and Migration Investigation". The investigation presents field and laboratory results for PCBs in soil at the Former PCB Manufacturing Area that delineate the PCB-contaminated area and proposes monitoring well locations. The following observations and comments are provided:

- The areal extent of soils contaminated with PCBs >25 mg/kg is approximately 194,000 sq. ft. or 4.4 acres. This footprint appears to much larger than the original area that the Former PCB Manufacturing unit was located on.
- Outside the perimeter of the 25 mg/kg total PCB contour line, PCBs (<1 mg/kg) are present in some subsurface soil composite samples taken from 10 to 15-feet below ground surface. At these locations, the deep subsurface soils are typically identified as wet sands. At sample location PMA-BS-11, PCBs at 0.64 mg/kg are identified in wet silt and sand 15 to 20-feet below ground surface.
- There is one area where further sampling should be performed to accurately assess the 25 mg/kg total PCB contour line. At PMA-BS-13, there are no samples taken outside the perimeter of the 25 mg/kg total PCB contour line to confirm the proper location of the contour line.
- The proposed monitoring well locations for PMA- MW-1, PMA-MW-2, and PMA-MW-3 are 140 to 160-feet downgradient from the 25 mg/kg total PCB contour line. This is too far. Install the monitoring wells slightly offset from boring locations PMA-BS-19, PMA-BS-24, and PMA-BS-25 which are located immediately outside the 25 mg/kg total PCB contour line. Based on the boring logs, groundwater in the SHU will likely be encountered in the thick, fine to medium grained, poorly graded sand layer identified from 2 to 10-feet below ground surface in this area.
- Within 14 days of completion of the installation of the new monitoring well clusters, provide the well construction logs and reports to EPA.
- Provide notification to EPA in writing at least 14 days prior to sampling the four new monitoring well clusters.
- Provide the date that the first quarterly groundwater monitoring report is expected to be submitted.

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May 24, 2006

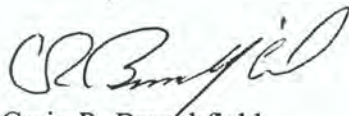
Mr. Kenneth Bardo
U.S EPA Region V
Corrective Action Section
Enforcement Compliance Branch
77 West Jackson Boulevard DE-J9
Chicago, IL 60604-3507

Re: In Situ Thermal Desorption (ISTD) Treatability Test
Response to Comments
W.G. Krummrich Facility

Dear Mr. Bardo,

Enclosed please find our response to EPA's comments on the In Situ Thermal Desorption (ISTD) Treatability Test Report for the W.G. Krummrich Facility. Should you have any questions please contact me at (314) 674-6768.

Sincerely,



Craig R. Branchfield
Manager, Remedial Projects

GENERAL COMMENTS

Note: Specific action items are highlighted in yellow

1. As outlined in the ISTD Work Plan, soil samples for the treatability tests were collected from locations and depths expected to have the maximum concentrations of PCBs or MCB/DCBs, as applicable, based on historical site investigation data. During initial benchmarking analyses of the soil samples collected for treatability testing, it was discovered that the actual concentrations in these samples were far below the targeted historical concentrations. Solutia contacted EPA and proposed to spike the respective samples with laboratory-grade solutions of the compounds of concern (COCs) (i.e., PCBs or MCB and DCBs), to better simulate historical concentrations and perform more conservative bench-scale tests.

The concentration of total PCBs in the soil test sample from the Former PCBs Manufacturing Area was 2,447 milligrams per kilogram (mg/kg), as compared to a historical maximum concentration at the same location of 22,100 mg/kg. Through further analysis, it was determined that spiking the soil test sample to achieve concentrations of approximately 22,000 mg/kg would require a quantity of pure PCBs not commercially available in the United States (i.e., due to the Toxic Substances Control Act [TSCA] ban on PCBs manufacturing imposed in the late 1970s). Therefore, in an e-mail message dated September 19, 2005, we approved Solutia's request to proceed with the bench-scale ISTD test with the sample in its present condition (i.e., total PCBs concentration of 2,447 mg/kg).

As shown in Table 1 below, the concentrations of MCB and DCBs in the soil test samples collected from the Former Chlorobenzene Manufacturing Area, as well as in those samples following spiking with MCB and DCB solutions, were below the historical high concentrations (except for total DCBs in the unsaturated zone sample).

Table 1: Comparative Concentrations of MCB and DCBs in Soil Samples

Sample ID	Compound	Concentrations (mg/kg)		
		Historical Maximum	Soil Bench-Test Sample	Soil Bench-Test Sample, After Spiking
Unsaturated Zone (composite of SCTB67 at 11 ft bgs and DNAPL K-4 at nine ft bgs)	MCB	23,000	870	14,000
	Total DCBs	13,850	117	14,132
Saturated Zone SHU (DNAPL K-4 at 16.5 ft bgs)	MCB	1,600	210	560
	Total DCBs	2,950	1,270	1,865

ft bgs = feet below ground surface

Ideally, the soil bench-test samples as collected, and/or following spiking, would have exhibited concentrations closer to the historical maximums. However, this was probably not a critical factor for the test results and their interpretations. All ISTD bench-scale tests achieved contaminant concentration reductions for PCBs or MCB/DCBs, as applicable, of greater than 99.8 percent. If the contaminant concentrations had been more similar to the historical concentrations, a slightly longer test period and/or higher applied temperature may have been necessary to achieve similarly excellent results, but on balance

the ISTD technology should be capable of treating soil exhibiting the historical maximum concentrations, based on these tests and on field case histories.

The above-mentioned difficulties associated with collection of samples with the desired representative concentrations, as well as with MCB/DCBs spiking, are factors that affect the conclusions drawn from these tests. **Provide an uncertainty analysis (i.e., a description of test elements that did not occur as planned or external factors affecting the test results, and the influence of those elements/factors on the test conclusions and ability to scale up the technology to a field pilot test).** As discussed at our March 7, 2006, meeting, the uncertainty analysis may be submitted as a follow-up technical memorandum (addendum) to the Bench Test Report.

RESPONSE: As discussed in the ISTD treatability test report, the starting concentrations of PCBs and MCB/DCB in the samples from the Former PCB Manufacturing Area and the Former Chlorobenzene Process Area, respectively, were below the target starting concentrations (i.e., the historic maximums detected). The MCB/DCB samples were spiked with MCB/DCB in an effort to increase the soil concentrations to near historic maximum levels. Even following spiking, the concentrations of MCB/DCB in the unsaturated and saturated samples were generally less than the historic maximums. Therefore, there is some uncertainty as to whether the results of the ISTD treatability study, based on the lower starting concentrations, are representative of the performance that can be expected in the field for areas with concentrations at or near the historic maximums.

For both the PCB and MCB/DCB samples, the treatability study indicated that ISTD treatment would be effective in achieving the required removal efficiencies and low residual concentrations, regardless of the starting concentrations. This is because the thermal removal mechanisms are independent of the starting concentration. Higher starting concentrations would result in increased vapor concentrations in the off-gas but not affect the cleanup level achieved in the laboratory study or in the field. A slightly longer treatment time may be required to desorb, volatilize, and sweep the compounds out of a location in the subsurface with higher concentrations, however, the relatively long duration of the field scale applications (several months) relative to the laboratory study (several days) will ensure that sufficient time is allowed to reach the desired cleanup objectives. In addition, interim sampling typically performed during field applications at the coolest locations, can be used to determine if further heating is required to achieve the goals.

Therefore, differences in historic maximum and actual starting concentrations did not affect the conclusions of the study with respect to the effectiveness of ISTD for the treatment of the PCB or MCB/DCB areas.

Four other potential sources of uncertainty were identified after a review of the ISTD treatability test results: 1) soil heterogeneity, 2) sample handling, 3) homogeneity of spiked samples and 4) representation of field conditions. Each of these potential sources of uncertainty is discussed below.

Soil Heterogeneity - A potential source of uncertainty when performing laboratory studies is how representative are the soil samples being tested with respect to the range of soil types or subsurface heterogeneity at the site. Thermal conductivity, however, is very uniform over a wide range of soil types and thus the rate of heat-up and distribution of heat is relatively uniform, regardless of soil type or degree of heterogeneity. Therefore, there is little uncertainty, with respect to ISTD being able to achieve the target temperatures in the field if the system is designed and implemented properly.

Although removal mechanisms (i.e., desorption and vapor transport) would be affected by soil heterogeneity (i.e., vapor flow in tighter soils would be slower), field applications of ISTD incorporate sufficient time for thorough flushing of vapors to occur. For example, more than 500 pore volumes of steam and vapors would be produced within the treatment zone and removed by the vapor collection system if 30 to 50% of the water content is boiled off during heating. This is a typical design approach for a target temperature of 100°C. If the target temperature is >100°C, then significantly more pore

volumes of steam will be produced and removed and once the soil is dry, the relative vapor permeability will increase by 2-3 orders of magnitude, resulting in a significant increase in vapor flow and contaminant removal rates.

In summary, due to the invariant nature of soil thermal conductivity and the significant enhancement of vapor flow at temperatures at and above 100°C, ISTD is not affected by soil heterogeneity and the results and conclusions of the laboratory studies based on the samples collected from the site are valid indicators of what can be accomplished at field scale.

Sample Handling - Potential sources of uncertainty that could affect the conclusions of the laboratory treatability studies are the steps taken to homogenize, spike, and place the soil into the treatment cylinders. Primary concerns include: 1) losses of volatile compounds during mixing and handling, and 2) thorough mixing/homogenization of the soil to get even distribution of the compounds of interest within the sample aliquots to ensure that the starting concentrations in the soil placed in the treatment cylinder are known.

As described in Appendix A of the ISTD treatability study report, the following steps were taken to minimize and/or assess the uncertainties associated with sample handling:

- Homogenization, spiking, and handling were all performed with the soil at 4°C. This minimizes the rate of vaporization of the volatile compounds and limited the amount of mass loss.
- Triplicate samples of the spiked soil (saturated and unsaturated soil from the MCB/DCB area) were analyzed for VOCs and SVOCs to determine the level of reproducibility and consistency of the spiking protocol and to establish the starting concentrations.

As described above, the results and conclusions of the ISTD treatability study are not entirely dependent on the magnitude or absolute values of starting concentrations, but on the concentrations of the compounds remaining after treatment. Thus, some volatile losses during mixing and handling can be tolerated. In addition, the triplicate analyses of spiked pre-treated soil provided confidence that the magnitude of the starting concentrations in the treatment cylinders were known and could be used to assess the percent removals following treatment.

Homogeneity of Spiked Samples - Triplicate VOC and SVOC analyses were performed on the unsaturated and saturated samples from the MCB/DCB area in order to assess the degree of homogeneity of the samples following spiking.

One uncertainty identified during the study was the difference in reported concentrations of MCB and DCB for the VOC and SVOC analyses. The VOC results consistently reported higher concentrations than the SVOC analyses. Apparently, the SVOC analytical method (EPA Method 8270C) was not as effective as the VOC analytical method (EPA Method 8260B) at recovering the mass of MCB and DCB present in the soil from the site. Because the VOC analyses provided results closer to the predicted MCB and DCB concentrations for the spiked soil samples, the VOC data were used throughout the study to characterize starting and post-treatment concentrations and to calculate removal efficiencies. Thus, uncertainty due to the difference in VOC and SVOC results for MCB and DCB was eliminated by concluding that the VOC data provided the best indication of the concentrations of MCB and DCB in the soil samples.

Representation of Field Conditions - The thermal treatability tests provide a good representation of the actual removal efficiencies experienced at field scale. It is important to consider that the ISTD remedial system is designed to achieve the target temperature at the coolest locations within the target treatment zone within the well field. These locations correspond to the centroids or the farthest distances from the heater wells. By the time the centroids reach the target temperature (i.e., the temperature that the treatment tests are conducted at), most of the site will have been at or above the target temperature for prolonged periods of time (weeks to months). Thus, the laboratory tests provide a reasonable, yet conservative prediction of the removal efficiencies and levels of treatment achievable at field scale.

Conclusions - Although a laboratory test cannot reasonably be expected to replicate the range of conditions that will be experienced in the field at a site, the laboratory thermal treatment tests performed on soil samples from the W.G. Krummrich Facility provide a reasonable representation of the primary removal mechanisms that would operate at a full-scale application of ISTD at the facility and of the level of treatment that could be achieved. The largest potential source of uncertainty in using the results achieved in the laboratory to predict what will be achieved in the field is the temperature that the soil will be exposed to and the duration of heating. This is because at field scale the temperature within the treatment zone changes as a function of distance from the heaters and over time. However, as described above, ISTD systems are designed and implemented to attain the target temperature at the coolest locations within the target treatment zone within the heater well field for a minimum length of time. Thus, by setting achievement of the target temperature at the coolest locations within the target treatment zone within the well field as an operational goal, the temperature of the rest of the well field will be equal to or greater than the target temperature and it is reasonable to expect that the level of treatment obtained in the field will be as good or better than what was observed in the laboratory.

2. The average 1,4-DCB value for the SHU saturated zone sample (DNAPL K-4 at 16.5 ft bgs) was listed as 620,000 micrograms per kilogram ($\mu\text{g/kg}$) in Table 3 of the ISTD Bench Test Report and in Tables 14 and 16 of Appendix A; the correct average value based on replicate results in Table 14 should be 600,000 $\mu\text{g/kg}$. This same average pre-treatment value was used in Table 7 of the ISTD Bench Test Report. Correct this data entry and ensure that all summary and report tables in the main report and Appendix A are accurate.

RESPONSE: The averages reported were based on data from the diluted analysis but the data for the 3 replicates were from the undiluted analysis. Table 14 (attached) was revised to include data for the 3 replicates from the diluted analyses.

3. Post-treatment PCB samples at 300 degrees Celsius ($^{\circ}\text{C}$), 350 $^{\circ}\text{C}$, and 425 $^{\circ}\text{C}$ were apparently analyzed in duplicates, but the post-treatment MCB/DCBs samples from the unsaturated zone and the SHU were without a VOCs duplicate analysis. The lack of data from duplicate samples could raise questions on the efficiency of post-treatment homogenization and the representativeness of the MCB/DCBs data used to calculate the thermal desorption efficiencies for the unsaturated and saturated aliquots. Address this apparent inconsistency in the uncertainty analysis technical memorandum.

RESPONSE: Duplicate analyses were performed on the post-treatment PCB samples to assess the degree of variability in concentration and treatment throughout the sample in the treatment cylinder. These data indicated that treatment was thorough throughout the soil within the treatment cylinder (i.e., there was very good reproducibility between the duplicate post-treatment PCB samples).

Duplicate analyses were not performed for the post-treatment VOC samples. Thus, there is some uncertainty as to whether the post-treatment VOC data are representative of conditions throughout the treatment cylinder. Based on the similarity of the post-treatment PCB duplicates, however, it is reasonable to assume that the VOC analyses provide an accurate measurement of the concentration of VOCs present in the soil following testing. In other words, the treatment test setup resulted in uniform treatment of all of the soil within the treatment cylinder.

4. Per the ISTD Bench Test Work Plan, total extractable organic halogens (EOX) was analyzed in pre-test and post-test soil samples; however, these data are not evaluated in the ISTD Bench Test Report. Provide a discussion of the EOX results, and whether these data validate the calculated contaminant removal efficiencies based on the PCBs, MCB, and DCBs analytical data.

RESPONSE: Results of the extractable organic halides (EOX) were summarized in Tables 8, 13, and 18 of the Kemron Thermal Treatability Study. Note that these tables included the untreated as well as the treated results. Table 8 included the untreated and treated analytical results for the SHU

Unsaturated PCB SO825 material at 1.5'. Starting EOX concentrations in this sample were 91,000 mg/Kg and ending concentrations were as low as 40 mg/Kg, a removal efficiency of 99.96 percent.

Untreated and treated EOX results for the SHU Unsaturated MCB/DCB SCTB-67 @ DNAPL K-4 material at 9' were included in Table 13. Spiked untreated starting EOX concentrations ranged from 1500 - 3400 mg/Kg and finishing treated concentrations were less than 10 mg/Kg, a concentration reduction of 99.33 to 99.71 percent.

Table 18 included the spiked untreated EOX results for the SHU Saturated MCB/DCB DNAPL K-4 material at 16.5', which ranged from 750 - 1100 mg/Kg. With treated concentrations of EOX less than 10 mg/Kg, removal efficiencies of 98.67 to 99.09 percent were achieved.

SPECIFIC COMMENTS

Section 4.0 Thermal Treatment Evaluations

1. This section states that a **constant airflow of 50 milliliters per minute (mL/min)** was passed through the test cylinder, as this would "provide a good simulation of full-scale airflow rates." **Provide the supporting calculations and/or other justification explaining why this airflow would be similar to that employed in a field-scale application.**

RESPONSE: The airflow rate was set at 50 ml/min for all of the testing. Based on past experience and comparison of laboratory study results with field performance, this airflow rate provides good simulation of field scale conditions. It is important to consider that the actual airflow rate in the field is variable and depends on such things as permeability and moisture content of the soil, in-situ vacuum/pressure differential, proximity to a vacuum extraction point, and steam generation rate. The primary objective of the airflow in the laboratory studies is to provide a means for vapor to move through and out of the test cylinder as would happen at field scale. Because the actual airflow rate will change as a function of time and location in the subsurface, the exact rate used during the test is not as important as being able to use and sustain the same rate throughout the tests at various temperatures. Using the same airflow rate for each test allows a comparison of removal efficiency as a function of temperature alone.

2. As shown on Figure 3, a **water flow rate of between 3.8 mL/min and 4.2 mL/min** was used to produce steam in a second oven. The steam was then directed into the oven containing the test cylinder during the saturated zone sample test, in order to simulate field conditions inside the SHU. **Provide the supporting calculations and/or other rationale for selecting this range of water flow rates.**

RESPONSE: As with the airflow rate, the steam flow rate will vary within the treatment system depending on the following: permeability of the soil, in-situ vacuum/pressure differential, proximity to a vacuum extraction point, steam generation rate, rate of heat loss/condensation, and proximity to the water table. The objective of the saturated tests was to simulate conditions near the water table where steam would be consistently produced and pass through the soil. The water flow rate was experimentally established for each treatment temperature so that the flow was sufficient to keep a constant presence of moisture in the soil treatment reactor and also a sufficient supply in the steam generator so as not to overflow or allow for complete evaporation. Thus, the experimental design (i.e., water flow rate) provided a reasonable representation of likely conditions in the subsurface near the water table. Actual conditions will be variable, and zones with less steam flow will likely not experience as high a mass removal rate as observed in the study, whereas zones with more steam flow will likely experience higher mass removal rates.

Section 5.0 Study Results and Conclusions

3. When discussing the results of the unsaturated zone sample from the Former PCB Manufacturing Area, the report states that, "it is reasonable to expect that most if not all of the biphenyls would have been removed at 300°C if a longer treatment time had been used (e.g., 144 hours or six days)." Provide an explanation of how the anticipated six-day extra treatment time was calculated.

RESPONSE: The longer treatment time suggested was twice the treatment time used for the treatability studies. As described in the report and in this Response to Comments, ISTD removal efficiency is as much a function of time as it is of temperature. For example, ISTD test results have shown that subjecting a soil to 300°C for 3 days resulted in higher removal efficiency (lower post-treatment concentrations) for benzo(a)pyrene, than 400°C for 1 day.

4. The total DCBs concentrations under the 132°C and 200°C columns listed in Table 7 do not correspond to the sum of individual DCB isomer concentrations, whether one assumes that the 1,3-DCB values were equal to the detection limits or equal to zero. Check the total DCBs values listed in Table 7 for accuracy and revise accordingly.

RESPONSE: A revised Table 7, which was checked for accuracy and revised accordingly, is attached.

Appendix A Thermal Treatability Study Report (prepared by Kemron Environmental Services)

5. Some data accuracy issues were noted during review of this appendix. To address these issues, check and correct the following:

In Tables 10 and 10A, correct the header information to indicate saturated MCB/DCB from sample

RESPONSE: Revised Tables 10 and 10A are attached.

- On page 9, paragraph 3, replace 560 mg/kg with 730 mg/kg as the upper limit of the analysis range.

RESPONSE: Paragraph 3 on Page 9 of the Kemron Thermal Treatability Study Report will be revised to read as follows:

"The testing results for the saturated soil are presented in Tables 14 and 15. A review of volatile analyses in Table 14 indicates that MCB ranged from 370mg/kg to 730 mg/kg for an average MCB concentration of 560 mg/kg, representing approximately 35% of the target concentration."

- In Section 5.2, clarify that no duplicate samples were analyzed for post-treatment evaluation of unsaturated MCB/DCBs samples.

RESPONSE: Section 5.2 will be rewritten as follows:

"Following thermal treatment, each treated soil was homogenized and submitted for analytical testing to Severn Trent Laboratories. Unlike the PCB soils, duplicate analyses of the treated material were not analyzed. The following chemical characterization analyses were conducted on aliquots of the thermally treated MCB/DCM soils, in accordance with the referenced test methods."

- In Section 5.2.1, paragraph 2, compare the post-treatment values for 132°C with the 16.3 mg/kg value listed in Table 6 of the ISTD Report. Revise accordingly to be consistent.

RESPONSE: Section 5.2.1, Paragraph 1 will be revised as shown below:

"Total DCB concentration was reduced from approximately 14,000mg/kg to 16.3 mg/kg at 132 °C and 1.2 mg/kg at 200 °C."

6. In Section 7.0, include a discussion of whether the different test temperatures resulted in significant differences in the concentrations of PCBs, MCB, and DCBs in the post-treatment samples. Also, it should be noted that the temperature of the heating source (oven) and moisture content affects the length of time required to raise the soil temperature from around 100°C (the boiling point of water) to the desired level, as confirmed by the noticeable plateaus in the soil temperature profiles recorded. This observation has significant implications to schedule, power requirements, and equipment design when planning field-scale pilot technology demonstrations or full-scale ISTD implementation.

RESPONSE: Section 7.0 will be revised as indicated below:

"KEMRON performed the treatability study in order to evaluate thermal treatment effectiveness at reducing contaminants of concern (COC). The principal constituents were monochlorobenzene (MCB), dichlorobenzene (DCB) and polychlorinated biphenyls (PCBs).

The study was performed in accordance with the Work Plan submitted to USEPA by Solutia, Inc., including Work Plan modifications submitted by Solutia. Specifically two additional treatment temperatures were added for the saturated soil. In addition, KEMRON performed spiking with MCB and DCB of the saturated and unsaturated soils in order to achieve concentrations corresponding to historical data for the site materials.

Testing results obtained from the study indicate that thermal treatment was successful at reducing contaminant concentrations under laboratory conditions.

Three temperatures were used in the PCB treatability tests: 300, 350 and 400°C. The temperature change from 300 to 350°C resulted in the most significant reduction in Total PCB concentrations. At 300°C, there were Total PCBs present in the treated soil sample and the magnitude of the reporting limit was in the hundreds of ug/Kg. No PCBs were detected at the 350°C treatment temperature but the reporting limits were also in the hundreds of ug/kg. While the final treatment temperature of 400°C resulted in one detectable concentration, reporting limits were lower than for the other two treatment temperatures.

Treatment temperatures of 100, 132 and 200°C were used during the unsaturated and saturated soil MCB/DCB treatability tests. For unsaturated soils, the temperature change from 132 to 200°C resulted in the greatest reduction in VOC, SVOC and EOX concentrations. For saturated soils, VOC concentrations were consistent throughout the temperature range while the most significant reduction in SVOC and EOX concentrations occurred when the temperature changed from 132 to 200°C.

The temperature of the muffle furnace and moisture content of the soil sample affects the length of time needed to raise the soil temperature from around 100°C to the target treatment levels of 132 and 200°C as evidenced by the noticeable temperature plateaus in the recorded soil temperature profiles. The presence of moisture in the saturated soil samples resulted in a longer time to reach the target treatment temperatures. Based on temperature monitoring data, an estimated additional 24 hours were needed to reach target treatment temperatures for saturated soil samples."

Appendix B Data Validation Report

7. Appendix A contains data questions and concerns for the laboratory, including raw data not received from the laboratory (Section 4.5.1) and J-flagged data without sufficient explanation (Section 4.5.2). Address all missing data/information noted in the data validation report or provide an explanation why those should not be a concern for the treatability tests.

RESPONSE: - Ultimately, data validation is intended to determine whether the laboratory is capable of producing quality data and if the data collected for a specific project was completed according to industry standards. The data validation process can also address secondary validation objectives such as data package completeness. The items missing from the data package did not affect the capability of the laboratory for generating quality data, but it did indicate that additional checks and balances could be improved upon during the data package generation at the laboratory. Although the validation is important to demonstrate that the laboratory is producing results that meet the industry standards and therefore that valid conclusions can be drawn during the thermal study, the missing data does not materially impact the conclusions drawn from the thermal treatability study.

Table 7
SHU Saturated MCB/DCB
SCTB-67 @ DNAPL -K-4 @ 16.5'
Results (µg/kg)

COC	Avg. Pre-Treatment Spiked Conc.	Thermal Treatment @ 100°C 72 Hour Retention		Thermal Treatment @ 132°C 72 Hour Retention		Thermal Treatment @ 200°C 72 Hour Retention	
		VOC Analysis	% Removal	VOC Analysis	% Removal	VOC Analysis	% Removal
Chlorobenzene (MCB)	560,000	62	99.9889%	66	99.979%	59	99.989%
1,2-Dichlorobenzene	1,100,000	<5.2	99.9998%	9	99.999%	14	99.999%
1,3-Dichlorobenzene	180,000	<5.2	99.9986%	<4.7	99.999%	<5	99.999%
1,4-Dichlorobenzene	620,000	<5.2	99.9996%	7	99.999%	6	99.999%
Total Dichlorobenzenes (DCB)	1,900,000	<5.2	99.9999%	16	99.999%	20	99.999%
Total MCB+DCB	2,460,000	62	99.9975%	82	99.997%	79	99.997%

KEMRON ENVIRONMENTAL SERVICES, INC.
TERRATHERM, INC
W.G.K. Solutia Treatability Study

TABLE 10
Summary of Total Semivolatile Analyses - EPA Method 8270C

TOTAL SEMIVOLATILES	RESULTS (ug/kg)							
	SHU Saturated MCB/DCB							
	DNAPL-K-4 @ 16.5'							
	Spiked/1st Run		Spiked/2nd Run		Spiked/3rd Run		Spiked Average ₀₁	
	Result	Reporting Limit	Results	Reporting Limit	Results	Reporting Limit	Results	Reporting Limit
Phenol	-	46000	-	45000	-	91000	-	45000
Bis (2-Chloroethyl) ether	-	46000	-	45000	-	91000	-	45000
2-Chlorophenol	-	46000	-	45000	-	91000	-	45000
1,3-Dichlorobenzene	850,000	230000	1,600,000	220000	14,000,000 R	2300000	1,200,000	220000
1,4-Dichlorobenzene	1,700,000	230000	3,300,000	220000	29,000,000 R	2300000	2,500,000	220000
1,2-Dichlorobenzene	1,900,000	230000	3,600,000	220000	31,000,000 R	2300000	2,700,000	220000
2-Methylphenol	-	46000	-	45000	-	91000	-	45000
3-Methylphenol	-	46000	-	45000	-	91000	-	45000
4-Methylphenol	-	46000	-	45000	-	91000	-	45000
N-Nitrosodi-n-propylamine	-	46000	-	45000	-	91000	-	45000
Hexachloroethane	-	46000	-	45000	-	91000	-	45000
Nitrobenzene	16,000	46000	-	45000	120,000 R	91000	16,000	45000
Isophorone	-	46000	-	45000	-	91000	-	45000
2-Nitrophenol	-	46000	-	45000	-	91000	-	45000
2,4-Dimethylphenol	-	46000	-	45000	-	91000	-	45000
Bis (2-Chloroethoxy) Methane	-	46000	-	45000	-	91000	-	45000
2,4-Dichlorophenol	-	46000	-	45000	-	91000	-	45000
1,2,4-Trichlorobenzene	-	46000	-	45000	-	91000	-	45000
Naphthalene	-	46000	-	45000	-	91000	-	45000
4-Chloroaniline	-	91000	-	89000	-	180000	-	89000
Hexachlorobutadiene	-	46000	-	45000	-	91000	-	45000
4-Chloro-3-methylphenol	-	46000	-	45000	-	91000	-	45000
2-Methylnaphthalene	-	46000	-	45000	-	91000	-	45000
Hexachlorocyclopentadiene	-	46000	-	45000	-	91000	-	45000
2,4,6-Trichlorophenol	-	46000	-	45000	-	91000	-	45000
2,4,5-Trichlorophenol	-	46000	-	45000	-	91000	-	45000
2-Chloronaphthalene	-	46000	-	45000	-	91000	-	45000
2-Nitroaniline	-	240000	-	230000	-	470000	-	230000
Dimethyl phthalate	-	46000	-	45000	-	91000	-	45000
Acenaphthylene	-	46000	-	45000	-	91000	-	45000
2,6-Dinitrotoluene	-	46000	-	45000	-	91000	-	45000
3-Nitroaniline	-	240000	-	230000	-	470000	-	230000
Acenaphthene	-	46000	-	45000	-	91000	-	45000
2,4-Dinitrophenol	-	240000	-	230000	-	470000	-	230000

KEMRON ENVIRONMENTAL SERVICES, INC.
TERRATHERM, INC
W.G.K. Solutia Treatability Study

TABLE 10
Summary of Total Semivolatile Analyses - EPA Method 8270C

TOTAL SEMIVOLATILES	RESULTS (ug/kg)							
	SHU Saturated MCB/DCB							
	DNAPL-K-4 @ 16.5'							
	Spiked/1st Run		Spiked/2nd Run		Spiked/3rd Run		Spiked Average ⁽¹⁾	
	Result	Reporting Limit	Results	Reporting Limit	Results	Reporting Limit	Results	Reporting Limit
4-Nitrophenol	-	240000	-	230000	-	470000	-	230000
Dibenzofuran	-	46000	-	45000	-	91000	-	45000
2,4-Dinitrotoluene	-	46000	-	45000	-	91000	-	45000
Diethyl phthalate	-	46000	-	45000	-	91000	-	45000
4-Chlorophenyl-phenyl ether	-	46000	-	45000	-	91000	-	45000
Fluorene	-	46000	-	45000	-	91000	-	45000
4-Nitroaniline	-	240000	-	230000	-	470000	-	230000
4,6-Dinitro-2-methylphenol	-	240000	-	230000	-	470000	-	230000
N-Nitrosodiphenylamine	-	46000	-	45000	-	91000	-	45000
4-Bromophenyl-phenyl ether	-	46000	-	45000	-	91000	-	45000
Hexachlorobenzene	-	46000	-	45000	-	91000	-	45000
Pentachlorophenol	-	240000	-	230000	-	470000	-	230000
Phenanthrene	-	46000	-	45000	-	91000	-	45000
Anthracene	-	46000	-	45000	-	91000	-	45000
Di-n-Butyl phthalate	-	46000	-	45000	-	91000	-	45000
Fluoranthrene	-	46000	-	45000	-	91000	-	45000
Pyrene	-	46000	-	45000	-	91000	-	45000
Butyl benzyl phthalate	-	46000	-	45000	-	91000	-	45000
3,3'-Dichlorobenzidine	-	91000	-	89000	-	180000	-	89000
Benzo(a)anthracene	-	46000	-	45000	-	91000	-	45000
Chrysene	-	46000	-	45000	-	91000	-	45000
bis(2-ethylhexyl) phthalate	-	46000	-	45000	-	91000	-	45000
Di-n-octyl phthalate	-	46000	-	45000	-	91000	-	45000
Benzo(b)fluoranthene	-	46000	-	45000	-	91000	-	45000
Benzo(k)fluoranthene	-	46000	-	45000	-	91000	-	45000
Benzo(a)pyrene	-	46000	-	45000	-	91000	-	45000
Indeno(1,2,3-cd)pyrene	-	46000	-	45000	-	91000	-	45000
Dibenzo(a,h)anthracene	-	46000	-	45000	-	91000	-	45000
Benzo(g,h,i)perylene	-	46000	-	45000	-	91000	-	45000
Carbazole	-	46000	-	45000	-	91000	-	45000
2,2'-oxybis[1-chloropropane]	-	46000	-	45000	-	91000	-	45000

- (1) Average spiked concentrations are based on 1st and 2nd run only, 3rd run has been rejected as a results of data validation.
- Analyte was not detected at or above the reporting limit
- R Flag applied following data validation. The data has been rejected due to sufficient evidence that the results are not indicative of the results that would be produced by the analysis method under normal conditions

KEMRON ENVIRONMENTAL SERVICES, INC.
TERRATHERM, INC
W.G.K. Solutia Treatability Study

TABLE 10A - REANALYSIS

Summary of Total Semivolatile Analyses - EPA Method 8270C

TOTAL SEMIVOLATILES	RESULTS (ug/kg)							
	SHU Saturated MCB/DCB							
	DNAPL-K-4 @ 16.5'							
	Spiked/1st Run		Spiked/2nd Run		Spiked/3rd Run		Spiked Average	
	Result	Reporting Limit	Results	Reporting Limit	Results	Reporting Limit	Results	Reporting Limit
Phenol	-	4600	-	4400	-	4600	-	45000
Bis (2-Chloroethyl) ether	-	4600	-	4400	-	4600	-	45000
2-Chlorophenol	-	4600	-	4400	-	4600	-	45000
1,3-Dichlorobenzene	250,000 H	92000	540,000 H	89000	300,000 H	2300000	360,000	220000
1,4-Dichlorobenzene	520,000 H	92000	1,100,000 H	89000	620,000 H	2300000	950,000	220000
1,2-Dichlorobenzene	610,000 H	92000	1,200,000 H	89000	730,000 H	2300000	850,000	220000
2-Methylphenol	-	4600	-	4400	-	4600	-	45000
3-Methylphenol	-	4600	-	4400	-	4600	-	45000
4-Methylphenol	-	4600	-	4400	-	4600	-	45000
N-Nitrosodi-n-propylamine	-	4600	-	4400	-	4600	-	45000
Hexachloroethane	-	4600	-	4400	-	4600	-	45000
Nitrobenzene	-	4600	5100 H	4400	-	4600	1,700	45000
Isophorone	-	4600	-	4400	-	4600	-	45000
2-Nitrophenol	-	4600	-	4400	-	4600	-	45000
2,4-Dimethylphenol	-	4600	-	4400	-	4600	-	45000
Bis (2-Chloroethoxy) Methane	-	4600	-	4400	-	4600	-	45000
2,4-Dichlorophenol	-	4600	-	4400	-	4600	-	45000
1,2,4-Trichlorobenzene	-	4600	-	4400	-	4600	-	45000
Naphthalene	-	4600	-	4400	-	4600	-	45000
4-Chloroaniline	-	9200	-	8900	-	9200	-	89000
Hexachlorobutadiene	-	4600	-	4400	-	4600	-	45000
4-Chloro-3-methylphenol	-	4600	-	4400	-	4600	-	45000
2-Methylnaphthalene	-	4600	-	4400	-	4600	-	45000
Hexachlorocyclopentadiene	-	4600	-	4400	-	4600	-	45000
2,4,6-Trichlorophenol	-	4600	-	4400	-	4600	-	45000
2,4,5-Trichlorophenol	-	4600	-	4400	-	4600	-	45000
2-Chloronaphthalene	-	4600	-	4400	-	4600	-	45000
2-Nitroaniline	-	24000	-	23000	-	24000	-	230000
Dimethyl phthalate	-	4600	-	4400	-	4600	-	45000
Acenaphthylene	-	4600	-	4400	-	4600	-	45000
2,6-Dinitrotoluene	-	4600	-	4400	-	4600	-	45000
3-Nitroaniline	-	24000	-	23000	-	24000	-	230000
Acenaphthene	-	4600	-	4400	-	4600	-	45000
2,4-Dinitrophenol	-	24000	-	23000	-	24000	-	230000

KEMRON ENVIRONMENTAL SERVICES, INC.

TERRATHERM, INC

W.G.K. Solutia Treatability Study

TABLE 10A - REANALYSIS

Summary of Total Semivolatile Analyses - EPA Method 8270C

TOTAL SEMIVOLATILES	RESULTS (ug/kg)							
	SHU Saturated MCB/DCB							
	DNAPL-K-4 @ 16.5'							
	Spiked/1st Run		Spiked/2nd Run		Spiked/3rd Run		Spiked Average	
	Result	Reporting Limit	Results	Reporting Limit	Results	Reporting Limit	Results	Reporting Limit
4-Nitrophenol	-	24000	-	23000	-	24000	-	230000
Dibenzofuran	-	4600	-	4400	-	4600	-	45000
2,4-Dinitrotoluene	-	4600	-	4400	-	4600	-	45000
Diethyl phthalate	-	4600	-	4400	-	4600	-	45000
4-Chlorophenyl-phenyl ether	-	4600	-	4400	-	4600	-	45000
Fluorene	-	4600	-	4400	-	4600	-	45000
4-Nitroaniline	-	24000	-	23000	-	24000	-	230000
4,6-Dinitro-2-methylphenol	-	24000	-	23000	-	24000	-	230000
N-Nitrosodiphenylamine	-	4600	-	4400	-	4600	-	45000
4-Bromophenyl-phenyl ether	-	4600	-	4400	-	4600	-	45000
Hexachlorobenzene	-	4600	-	4400	-	4600	-	45000
Pentachlorophenol	-	24000	-	23000	-	24000	-	230000
Phenanthrene	-	4600	-	4400	-	4600	-	45000
Anthracene	-	4600	-	4400	-	4600	-	45000
Di-n-Butyl phthalate	-	4600	-	4400	-	4600	-	45000
Fluoranthrene	-	4600	-	4400	-	4600	-	45000
Pyrene	-	4600	-	4400	-	4600	-	45000
Butyl benzyl phthalate	-	4600	-	4400	-	4600	-	45000
3,3'-Dichlorobenzidine	-	9200	-	8900	-	9200	-	89000
Benzo(a)anthracene	-	4600	-	4400	-	4600	-	45000
Chrysene	-	4600	-	4400	-	4600	-	45000
bis(2-ethylhexyl) phthalate	-	4600	-	4400	-	4600	-	45000
Di-n-octyl phthalate	-	4600	-	4400	-	4600	-	45000
Benzo(b)fluoranthene	-	4600	-	4400	-	4600	-	45000
Benzo(k)fluoranthene	-	4600	-	4400	-	4600	-	45000
Benzo(a)pyrene	-	4600	-	4400	-	4600	-	45000
Indeno(1,2,3-cd)pyrene	-	4600	-	4400	-	4600	-	45000
Dibenzo(a,h)anthracene	-	4600	-	4400	-	4600	-	45000
Benzo(g,h,i)perylene	-	4600	-	4400	-	4600	-	45000
Carbazole	-	4600	-	4400	-	4600	-	45000
2,2'-oxybis[1-chloropropane]	-	4600	-	4400	-	4600	-	45000

- Analyte was not detected at or above the reporting limit

H Laboratory reanalyzed samples out of holding time due to the potential of a dilution calculation error.

KEMRON ENVIRONMENTAL SERVICES, INC.
TERRATHERM, INC
W.G.K. Solutia Treatability Study

TABLE 14

Summary of Total Volatile Analyses - EPA Method 8260B

TOTAL VOLATILES	SHU Saturated MCB/DCB							
	DNAPL-K-4 @ 16.5'							
	RESULTS (ug/kg)							
	Spiked/1st Run		Spiked/2nd Run		Spiked/3rd Run		Spiked Average	
	Result	Reporting Limit	Results	Reporting Limit	Results	Reporting Limit	Results	Reporting Limit
Acetone	-	130000	-	380000	-	340000	-	130000
Benzene	-	13000	-	38000	-	34000	-	13000
Bromodichloromethane	-	13000	-	38000	-	34000	-	13000
Bromoform	-	13000	-	38000	-	34000	-	13000
Bromomethane	-	13000	-	38000	-	34000	-	13000
2-Butanone	-	64000	-	190000	-	170000	-	64000
Carbon disulfide	-	13000	-	38000	-	34000	-	13000
Carbon tetrachloride	-	13000	-	38000	-	34000	-	13000
Chlorobenzene	420,000	13000	730,000	38000	530,000	34000	560,000	13000
* Chlorodibromomethane	-	13000	-	38000	-	34000	-	13000
Chloroethane	-	13000	-	38000	-	34000	-	13000
Chloroform	-	13000	-	38000	-	34000	-	13000
Chloromethane	-	13000	-	38000	-	34000	-	13000
1,2-Dichlorobenzene	820,000	32000	1,400,000	38000	980,000	34000	1,100,000	32000
1,3-Dichlorobenzene	130,000	13000	240,000	38000	170,000	34000	180,000	13000
1,4-Dichlorobenzene	480,000	13000	800,000	38000	570,000	34000	620,000	13000
1,1-Dichloroethane	-	13000	-	38000	-	34000	-	13000
1,2-Dichloroethane	-	13000	-	38000	-	34000	-	13000
1,1-Dichloroethene	-	13000	-	38000	-	34000	-	13000
cis-1,2-Dichloroethene	-	13000	-	38000	-	34000	-	13000
trans-1,2-Dichloroethene	-	13000	-	38000	-	34000	-	13000
1,2-Dichloropropane	-	13000	-	38000	-	34000	-	13000
cis-1,3-Dichloropropene	-	13000	-	38000	-	34000	-	13000
trans-1,3-Dichloropropene	-	13000	-	38000	-	34000	-	13000
Ethylbenzene	-	13000	-	38000	-	34000	-	13000
2-Hexanone	-	64000	-	190000	-	170000	-	64000
4-Methyl-2-pentanone	-	64000	-	190000	-	170000	-	64000
Methylene chloride	-	13000	-	38000	-	34000	-	13000
Styrene	-	13000	-	38000	-	34000	-	13000
1,1,2,2-Tetrachloroethane	-	13000	-	38000	-	34000	-	13000
Tetrachloroethene	-	13000	-	38000	-	34000	-	13000
Toluene	-	13000	-	38000	-	34000	-	13000
1,1,1-Trichloroethane	-	13000	-	38000	-	34000	-	13000
1,1,2-Trichloroethane	-	13000	-	38000	-	34000	-	13000
Trichloroethene	-	13000	-	38000	-	34000	-	13000
Vinyl chloride	-	13000	-	38000	-	34000	-	13000
Xylene, Total	-	26000	-	76000	-	68000	-	26000


- Analyte was not detected at or above the reporting limit

* Synonym to Dibromochloromethane

J LCS, LCSD, MS, MSD, MD, or Surrogate exceeds the control limits

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SOLUTIA

Solutions for a better life.

Solutia Inc.

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May 24, 2006

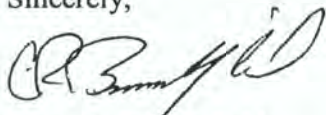
Mr. Kenneth Bardo
U.S EPA Region V
Corrective Action Section
Enforcement Compliance Branch
77 West Jackson Boulevard DE-J9
Chicago, IL 60604-3507

Re: Enhanced Aerobic Bioremediation (EABR) Treatability Test for the MHU/DHU
Response to Comments
W.G. Krummrich Facility

Dear Mr. Bardo,

Enclosed please find our response to EPA's comments on the Enhanced Aerobic Bioremediation (EABR) Treatability Test Report for the MHU/DHU at the W.G. Krummrich Facility. Should you have any questions please contact me at (314) 674-6768.

Sincerely,



Craig R. Branchfield
Manager, Remedial Projects

GENERAL COMMENTS

Note: Specific action items highlighted in yellow

1. The EABR bench-scale test attempted to demonstrate mass removal of MCB and DCBs, and to validate that any observed mass removal was due to biological degradation processes. The testing laboratory (Groundwater Services, Inc., [GSI] and Rice University) attempted to develop three lines of evidence:

- Reduction in total MCB and DCBs mass (demonstrated through reductions in soil sample concentrations before and after treatment) and reduction in column effluent concentrations over time in the treated columns.
- Significant growth in bacterial populations and key enzymes believed to be related to the degradation reactions in the treated columns.
- Absence of similar mass reduction, effluent contaminant reduction, bacterial populations, and key enzymes in the control (untreated) column.

In general, examination of the EABR bench test results indicated that some lines of evidence were validated, which would suggest that EABR could be a viable technology to treat MCBs and DCBs in the MHU. However, several of the test results were inconclusive or peculiar, particularly those from the control column. The positive indicators for EABR and the uncertainties can be summarized as follows:

- Reduction in Total MCB and DCBs Mass. MCB mass in the front and middle portions of the treated columns ranged between 80 percent and 100 percent for all tests. In addition, for test intervals longer than six weeks, nearly 100 percent of the MCB mass appeared to have been destroyed. Reduction in MCB mass in the end portions of the treated columns took longer to develop, but at eight weeks and longer, greater than 90 percent of that mass appeared to be destroyed. This result is not unreasonable, given that much of the injected oxygen was likely consumed in the upstream portions of the columns, thus requiring longer time intervals for the oxygen-saturated water front to reach the end portions of the columns.

The reductions in mass of total DCBs in the front and middle sections of the treated columns were similar to those for MCB (i.e., 90 percent or greater appeared to be destroyed after six weeks of treatment). However, the results for the end sections were less impressive. For example, the 10-week soil concentrations of 1,2-DCB and 1,4-DCB actually increased, possibly due to DCBs desorbing from the front and middle sections of the columns and then becoming fixed in the soils within the end sections of the columns (as stated in the EABR Bench Test Report). The 12-week mass removals, though better, were also inconsistent and low, ranging from approximately 45 percent to 65 percent.

- Growth in Bacterial Populations and Enzymes. Based on the tests performed (i.e., total plate counts and real time quantitative polymerase chain reaction [RTQ-PCR] tests), the quantities of total bacteria and most key enzymes appeared to increase significantly in the treated columns as compared to the untreated soil. Total bacterial populations increased between one and two orders of magnitude, and all enzymes except toluene di-oxygenase exhibited increases of similar or greater proportions. However, the concentrations of bacteria and enzymes also increased significantly in the control sample, possibly due to inadequate application of biocide. This occurrence affected the results for the control column, as discussed in the following bullet.
- Control Column Results. The control column did not produce the desired results, in terms of showing an absence of substantial MCB and DCBs removal in contrast to the treated columns. MCB reductions in the front and middle portions of the column were essentially identical to the treated columns (over 95 percent decreases in soil concentrations), and MCB reduction in the end portion was also substantial (approximately 70 percent). Total DCBs reductions in the front and middle portions ranged between

80 percent and 100 percent, while concentrations of all DCB isomers in the end portions increased substantially relative to the initial soil concentrations (again possibly due to desorption, transport, and accumulation of DCBs within the end-section soil). Furthermore, as mentioned earlier, total bacteria and enzymes appeared to increase significantly, although not to the degree noted in the treated columns. The EABR Bench Test Report attributes these findings to inadequate distribution of biocide within the control column, leading to substantial biological activity and degradation unintentionally occurring within the control. While this is a plausible explanation, the absence of robust control data removes an important line of evidence for the EABR bench-scale tests.

Another source of potentially significant error is the MCB/DCBs spiking. Under the circumstances, spiking the test samples with laboratory-grade MCB and DCBs was the most reasonable option to attempt to duplicate historical high concentrations detected in the source areas. However, freshly-spiked MCB/DCBs are typically much easier to attenuate than weathered or organic-bound MCB/DCBs, because there is insufficient time for them to equilibrate with the soil matrix and form DNAPL globules. Thus, more of the mass will tend to be captured temporarily on soil sorption sites, where it can readily be desorbed and flushed from the matrix. Moreover, the homogenization process, while advantageous for promoting uniformity of the sample aliquots, also tends to break down the soil matrix structure and prevent formation of DNAPL globules. The influence of sorption/desorption and flushing on the EABR bench-scale test results is not discussed in detail in the EABR Bench Test Report and could be considerable. For example, consider the first two weeks of the tests, before biological activity was stimulated through addition of oxygen. At a flow rate of 396 milliliters per day (mL/day) and average MCB concentration of 38 mg/L in the column effluent (see Figure 1 on page 4-3), an estimated 211 mg of mass (approximately 45 percent of the total initial MCB mass of 473 mg) was removed from the test columns during this period.

As requested for the ISTD Bench Test Report, provide an uncertainty analysis for the EABR Bench Test Report. Two of the primary issues the uncertainty analysis should address are:

- The expected mass removal due to desorption/flushing versus biodegradation for each of the test columns; and
- Whether compromise of the control sample due to inadequate sterilization has occurred during other, similar bench-scale tests.

The uncertainty analysis should also discuss the relative importance of the control column results in comparison to the other lines of evidence that suggest the occurrence of MCB and DCBs biodegradation. In addition, the uncertainty analysis should evaluate whether any abiotic processes (e.g., hydrolysis) might have caused significant disappearance of MCB or DCBs from the test and/or control columns. As discussed at our March 7, 2006, meeting, the uncertainty analysis may be submitted as a follow-up technical memorandum (addendum) to the Bench Test Report.

RESPONSE: Discussion of mass removal due to flushing versus biodegradation, the control column results, and abiotic mass removal processes is provided below.

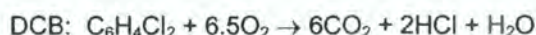
Mass Removal due to Flushing versus Biodegradation

In a DNAPL source zone, the contaminant flushing rate, or mass flux, is expected to be proportional to concentration. Samples for the MHU/DHU EABR Mass Removal Treatability Tests were collected at the highest known MCB/DCB concentrations in MHU/DHU at the Former Chlorobenzene Process Area. Consequently, mass removal due to flushing was high during performance of these tests.

While mass removal due to flushing decreased as the treatability tests progressed, mass removal due to biodegradation increased, which is consistent with measured increases in numbers of total bacteria and contaminant degrading enzymes:

Column	Mass MCB Removed (mg MCB)	Mass MCB Removed (mg O ₂ eq.)	Mass DCB Removed (mg DCB)	Mass DCB Removed (mg O ₂ eq.)	Mass Oxygen Consumed (mg O ₂)	Percent Biodegraded	Percent Flushed
2-Week	275	551	1,866	2,612	281	9	91
4-Week	479	959	2,296	3,215	542	13	87
6-Week	488	977	2,944	4,121	793	16	84
8-Week	551	1,101	4,174	5,844	986	14	86
10-Week	464	928	2,991	4,187	1,230	24	76
12-Week	398	795	4,047	5,665	1,500	23	77

To determine the amount of MCB/DCB mass removed in each column by biodegradation, the MCB/DCB soil concentration was converted to oxygen equivalents using stoichiometry-based conversion factors of: 0.5 mg MCB degraded per mg oxygen and 0.7 mg DCB degraded per mg oxygen. The stoichiometric reactions for aerobic biodegradation of MCB and DCB are:



Oxygen consumption during each test period was determined using calculated influent and average effluent concentrations. Mass removal due to biodegradation in each column is equivalent to the amount of oxygen consumed.

Based on the results of the MHU/DHU Mass Removal Treatability Tests, biodegradation is predicted to be the primary removal mechanism (90 percent or more removal from biodegradation) for soils with contaminant concentrations equal to or less than the 90th percentile concentration (584 mg/kg) at the Former Chlorobenzene Process Area:

MHU/DHU Conc. Summary Statistics (n=35)	Total VOC + SVOC Conc. (mg/kg)	Site to Column Concentration Ratio	Predicted % Flushed	Predicted % Biodegraded	Increase in Mass Removal Rate
Site Maximum	2,593	0.551	42.4	57.6	2.4x
Site 90 th Percentile	584	0.124	9.5	90.5	10.5x
Site 50 th Percentile	18	0.004	0.3	99.7	333x
Site 25 th Percentile	3.3	0.001	0.1	99.9	1,000x

Note: Site samples from locations DNAPL-K-2 through DNAPL-K-5

To make this determination, results observed in the 12-week treatability test were extrapolated to site conditions by multiplying the observed fraction flushed in the 12-week column (77%) by the ratio of site VOC+SVOC concentrations (as measured in the MHU/DHU underlying the Former Chlorobenzene Process Area during the RCRA Corrective Measures Study) to the initial average MCB+DCB concentration in the treatability test (4,702 mg/kg). Total VOC and SVOC concentrations measured at the site are utilized in this analysis to account for oxygen demand from other constituents.

Soil sampling and analysis in the Former Chlorobenzene Process Area indicates that MCB/DCB mass is unevenly distributed throughout the source zone with large areas of low concentrations and some "hot spot" areas of high concentration. Because of this uneven distribution, biodegradation will be the primary removal mechanism in most of the source zone and flushing would be the primary removal mechanism in "hot spots" if EABR was used as a source control technology. Over time, flushing will reduce "hot spot" concentrations to the point where biodegradation will be the primary removal mechanism. Since the May 26, 2004 CA750 Environmental Indicator Determination demonstrated that groundwater migration from the site was under control, continued flushing of MCB/DCB from the source area will not adversely impact

the Mississippi River. Results of the MHU/DHU EABR Mass Removal Treatability Test demonstrated that biodegradation does occur in soil with the highest known source area concentrations. As flushing of "hot spot" areas within the source zone progresses over time and source zone concentrations decrease, bioremediation will become the primary removal mechanism.

Inadequate Sterilization of Control Column

A search of the literature identified two laboratory studies where sodium azide was found to be ineffective as a biocide. Mackay et al. (1996) report ineffectiveness of sodium azide at a concentration of 100 mg/L as a biocide in a laboratory study of BTEX flushing rates from soil cores containing NAPL. As a result, the authors modified the experiment to include mercuric chloride at a concentration of 10 mg/L as the biocide. In the second study (Talley et al., 2002), sodium azide and mercuric chloride were reportedly ineffective at concentrations of 500 mg/L each in bioreactors treating PAHs aerobically. Mercuric chloride, which is generally considered superior to sodium azide as a biocide, was eliminated from use in the EABR test due to its toxicity to humans and also because it forms complexes with hydrocarbons that may reduce apparent concentrations (USEPA, 1991).

The USEPA report *Guide for Conducting Treatability Studies under CERCLA: Aerobic Biodegradation Remedy Screening* (USEPA, 1991) indicates that:

"Complete sterilization of soils can be difficult to accomplish. Incomplete mixing of sterilization agents with soils can result in pockets of surviving microbes in soil pores. In some cases, microbial populations can transform and detoxify sterilizing agents."

Based on the literature, compromise of control samples due to inadequate sterilization has occurred during other bench-scale tests similar to those performed for the MHU/DHU Mass Removal Treatability Tests.

Test Column versus Control Column Results

Based on effluent concentrations, MCB removal was significantly greater in biologically-active systems compared to the inhibited control by Week 3 of the test. The average biotic effluent concentration was 4.9 mg/L (with a standard deviation of 2.5 mg/L), compared to the control concentration of 13 mg/L, representing a 62% difference in the biological and control concentrations. Effluent DCB concentrations in all columns were relatively constant throughout the experiment due to the likely presence of DCB in the NAPL phase at the end portion of all columns, and therefore a significant concentration difference was not evident (though concentrations were lower in the biologically active columns for the last four weeks of the test). DCB mass removal based on soil sampling data, however, showed a significant enhancement in biologically-active systems over the inhibited control (i.e., DCB removal was 54 to 55% greater in the biological column than the inhibited control). Additional lines of evidence including oxygen depletion (from 48.6 mg/L to ~2 mg/L across the biotic columns) and microbial stimulation (100 to 1,000 times increases in total bacteria and chlorobenzene degrading enzymes in treated versus untreated soil) substantiate the conclusion that mass removal was due to aerobic bioremediation.

Although performance of the control was less than ideal, the data clearly demonstrate that: i) MCB and DCB mass removal was enhanced in biological columns compared to the inhibited control, and ii) the enhancement was due to aerobic biodegradation.

Evaluation of Abiotic Removal Processes

Abiotic processes were not likely mass removal mechanisms during the MHU/DHU Mass Removal Treatability Tests. Volatilization and sorption are two important abiotic removal mechanisms for MCB and DCB. Since the treatability tests were performed in sealed systems, volatilization was not a likely abiotic removal mechanism. MCB/DCB concentrations in column effluent indicate that sorption was not a likely abiotic removal mechanism.

According to Howard (1989), hydrolysis is not an environmentally relevant fate process for MCB and DCB. Hydrolysis occurs in the environment when a water molecule reacts with a saturated carbon atom that is bonded to an electronegative leaving group, such as a halogen atom. Since all the carbon atoms in MCB and DCB are unsaturated, these compounds are not susceptible to hydrolysis. Therefore, MCB/DCB loss due to hydrolysis was not a likely abiotic removal mechanism.

Howard (1989) indicates that direct photolysis of MCB can occur in surface water with a half life of 170 years; however, DCB photolysis is not significant in the environment. DCB is also resistant to oxidation by peroxy radicals. Given this information, photolysis and oxidation were not likely abiotic removal mechanisms.

2. As mentioned in General Comment No. 1 above, reductions in chlorobenzenes in end sections of the treated columns ranged from partial (approximately 70 percent for MCB) to non-existent (i.e., concentrations of total DCBs actually increased relative to the starting soil concentrations). In addition, the effluent concentration of total DCBs at Week 12 was 80 milligrams per liter (mg/L) in the treated column, also indicating that significant DCBs mass remained in the soil. **In the EABR Bench Test Report, it is speculated that due to the apparent increase in bacterial activity noted during the bench-scale tests, a prolonged test duration would result in the removal of most or all MCB and DCBs from the soil (i.e., as the oxygen-saturated water front is able to propagate through the entire column length). Discuss this topic further in the uncertainty analysis technical memorandum; specifically, the additional treatment duration believed necessary to duplicate the results observed for the front and middle sections of the columns should be discussed.** This duration could have important consequences for planning a field-scale pilot test of the EABR technology.

RESPONSE: Based on DCB soil data from the biotic columns, the middle section of the columns had greater than 99.9% mass reduction by week 10 suggesting that oxygen-rich water had reached that portion of the column. From this observation, the time for transport of the oxygen front can be estimated as four inches per ten weeks or approximately 0.005 ft/d. At that rate, the oxygen front would have been expected to breakthrough the end of the column after an additional five weeks.

Given that contaminant concentrations in the MHU/DHU Mass Removal Treatability Tests were about ten times the 90th percentile concentration in saturated MHU/DHU soils beneath the Former Chlorobenzene Process Area, oxygen transport in the aquifer is likely to be much faster than indicated by the treatability tests. An oxygen transport rate of 0.05 ft/d, ten times the rate estimated from the treatability tests, would result in a downgradient distance of influence of approximately 18 ft per year.

3. In the EABR Bench Test Report conclusions, it is speculated that the high mass removal of MCB in the control column was potentially due to the relatively high solubility and low soil affinity of this compound. If this is correct, the potential exists that a significant amount of the MCB in the treated columns could have been removed by simple flushing (as noted in General Comment No. 1). **The uncertainty analysis should discuss to what degree MCB could have been flushed from the system before it had the opportunity to be degraded by the bacterial colonies established in the oxygen-rich environment of the front and middle column sections.** This issue could have important consequences for field implementation (e.g., a pilot test), as it raises the question of whether an oxygen injection program and establishment of an active biotreatment zone in the field would be capable of degrading almost all of the MCB before it is flushed in significant quantities from the source areas.

RESPONSE: As discussed in the Response to Comment 1, biodegradation, not flushing, is expected to be the primary DNAPL removal mechanism at the MCB/DCB concentrations encountered in most of the saturated MHU/DHU soils beneath the Former Chlorobenzene Process Area. As discussed in Response to Comment 1, the MHU/DHU EABR Mass Removal Treatability Tests demonstrated that flushing is the primary mass removal mechanism in high concentration "hot spots" within the Former Chlorobenzene Process Area source zone. However, as flushing progresses over time and source zone concentrations

are reduced, bioremediation will become the primary mass removal mechanisms in these "hot spot" areas. In source areas with MCB/DCB concentrations less than or equal to the 90th percentile concentration (584 mg/kg), biodegradation will be the primary mass removal mechanism.

4. According to page 2-11 of the EABR Bench Test Work Plan, Solutia proposed to **calculate the milligrams of MCB and DCBs degraded per milligram of oxygen added**. Provide these calculations.

RESPONSE: The mass of MCB/DCB biodegraded per mass of oxygen supplied was calculated using the fraction of total mass removed by biodegradation (as reported in Response to Comment 1) and the mass of oxygen added to each column. Results are summarized on the following table.

Column	Total Mass MCB/DCB Removed (mg)	Mass MCB/DCB Removed by Biodeg'n (mg)	Mass Oxygen Added (mg O ₂)	Mass MCB/DCB Biodegraded per Mass O ₂ Added (mg/mg)
2-Week	2,141	171	324	0.53
4-Week	2,776	333	583	0.57
6-Week	3,432	515	841	0.61
8-Week	4,725	709	1,099	0.65
10-Week	3,455	864	1,358	0.64
12-Week	4,444	1,066	1,616	0.66

5. The EABR Work Plan (Section 2.4.2) states that all soil treatability samples will be analyzed for MCB, DCBs, and total extractable halogens (EOX). However, Table 4 of the EABR Report listed 1,300 mg/kg of EOX for all soil aliquots (i.e. C₂-C₈). **Provide an explanation why EOX for the C₂-C₈ soil aliquots was not analyzed separately as planned and why the 1,300 mg/kg was used as the representative EOX pre-treatment data. In addition, include discussions on the pre- and post-treatment results based on the EOX data and whether it validates the calculated mass removal of MCB and DCBs.**

RESPONSE: The EABR Work Plan stated that the MHU/DHU soil sample was to be homogenized then divided into 10 equal aliquots. Initial chemical characterization (VOCs, SVOCs, and EOX) was to be performed using Aliquots 1 and 2 of the homogenized MHU/DHU sample. Aliquot 3 was to be used for geotechnical characterization. Aliquots 4 through 10 were to be used for the seven MHU columns, with initial chemical characterization of these samples represented by results obtained from Aliquots 1 and 2. Upon determining that spiking of MCB/DCB was required to achieve historical maximum concentrations, and the possibility for significant variation in initial soil concentrations presented by spiking, it was decided that aliquots used to load columns should be analyzed individually for characterization of MCB and DCBs by EPA Method 8260. Due to soil volume limitations, each aliquot could not also be analyzed for SVOCs and EOX, and therefore Aliquots 1 and 2 were used for initial characterization of EOX and SVOCs per the work plan.

A summary of organic compounds detected in Aliquots 1 and 2 is provided in the table on page 4-2 of the EABR Treatability Test Report, and is partially reproduced below for reference. Since Aliquots 1 and 2 were duplicate samples, the relative percent difference (RPD) for analytes was calculated and is included in the table.

Constituent	MHU/DHU Aliquot 1 Sample	MHU/DHU Aliquot 2 Sample	Relative Percent Difference
MCB/DCB	mg/kg	mg/kg	% RPD
MCB	340	430	23
1,2-DCB	1,700	1,800	5.7

Constituent	MHU/DHU Aliquot 1 Sample	MHU/DHU Aliquot 2 Sample	Relative Percent Difference
1,3-DCB	410	500	20
1,4-DCB	1,500	1,600	6.5
Total DCBs	3,610	3,900	7.7
Extractable Organic Halides	mg/kg	mg/kg	% RPD
EOX	1,300	730	56
Other Detected Compounds	mg/kg	mg/kg	% RPD
Benzene	0.310	0.250 J	21
Toluene	0.360	0.350	2.8
1,2,4-Trichlorobenzene	11.0	13.0	17
Hexachlorobenzene	0.610	0.430	34
Sum of Chlorinated Organics by 8260 and 8270	3,961	4,343	9.2

As shown on the table, six chlorinated organic compounds were detected in each Aliquot. Concentrations all of the chlorinated compounds, except hexachlorobenzene, were higher in Aliquot 2 than in Aliquot 1. The sum concentration of chlorinated compounds in Aliquot 1 was 3,961 mg/kg, and in Aliquot 2 was 4,343 mg/kg. Converse to results for chlorinated compounds analyzed by 8260 and 8270, EOX concentrations measured in Aliquot 1 were higher at 1,300 mg/kg than in Aliquot 2 at 730 mg/kg. Based on this analysis, the higher EOX concentration of 1,300 mg/kg was used as the representative EOX initial concentration. These results, along with the large RPD for EOX, point out the inconsistencies of EOX data.

The EOX data does provide a line of semi-quantitative evidence supporting the conclusion that aerobic bioremediation enhanced mass removal. Regardless of whether 1,300 mg/kg or 730 mg/kg (or the average) is used as the initial concentration, the EOX reduction achieved at the end of the biotic test was substantial, as EOX was not detected in the 12-week biotic column at a detection limit of 10 mg/kg. Significant EOX (110 mg/kg) remained in the 12-week control column confirming enhanced removal in the biotic system.

SPECIFIC COMMENTS

Executive Summary (Item 2)

1. The statement that higher mass removal would have been achieved had the tests been extended should be supported by data on flow rates or gauge readings to eliminate the possibility that column plugging and/or readsorption prevented additional mass removal towards the end of the study period. Note that per page 11 of Solutia's responses to EPA comments dated May 27, 2005, pressure gauges were supposed to be installed to determine if back pressure was developing due to biomass buildup.

RESPONSE: Check valves, rather than gauges, were installed between the pump and column to prevent any backflow that could have resulted from backpressure due to column clogging. Any column plugging that occurred would have been detected by a lack of outflow from the columns and/or a build up of pressure between the column and the check valve. Any backpressure due to clogging would have ultimately caused the system to leak at a connection between the check valve and the column. The columns were checked several times per week and no problems were noted that could have resulted from column plugging. In addition, there were no indications of biomass buildup (e.g., biofilm formation, etc.) noted when columns were disassembled for final soil sampling.

Section 3.3.3 Column Preparation and Operation

2. On pages 3-6 and 3-7 of this section, soil sampling procedures for post-treatment samples from the various columns are described. Reportedly, Encore™ samplers were used to collect soil from each of the three column sections (front, middle, and end) for analysis of VOCs, while a composite sample from the entire length of the column was collected and submitted for moisture content, SVOCs, and EOX analyses. **Provide more detail on the soil sampling procedures, specifically:**

- Confirm that the VOC samples were all grab samples; and
- Describe how the composite samples were formed (i.e., were they a mixture of sub-samples from each section and were they homogenized prior to being submitted for analysis).

RESPONSE: Soil samples for VOC analysis were collected in accordance with EPA Method 5035 using a syringe-and-plunger style sampling device (equivalent to the Encore sampler) provided by the laboratory. Prior to collecting a sample, the plunger was retracted to a pre-set point, which allowed for collection of approximately 5 grams of soil. The sampling device was then filled with soil and the plunger was used to extrude the soil into a pre-weighed, labeled 40-mL sample vial provided by the laboratory. For each VOC soil sample, three 5-gram aliquots were collected. Two aliquots were extruded into pre-weighed sample vials containing sodium bisulfate as a preservative, and the third aliquot was extruded into a pre-weighed vial containing methanol. Sample vials were immediately placed in storage at 4 °C pending transport to the laboratory. A new sampling device was utilized for each sample interval.

Samples from the front portion (i.e., 0 to 2 inches from the inlet), middle portion (2 to 4 inches from the inlet), and back portion (4 to 6 inches from the inlet) of the column were grab samples collected as described above for MCB/DCB analysis by USEPA Method 8260 (the full list of VOC constituents were reported). For the front and end section samples, the threaded column cap was removed and a thin layer of exposed soil was gently scraped away using a stainless steel spatula. The sampling device was then pushed into the soil to collect the sample. For the middle section sample, a stainless steel spatula was used to scoop soil from the end of the column into a glass beaker until the soil in the middle section was reached. Then a new stainless steel spatula was used to collect approximately five grams of soil, which was placed in the sampling device. After all VOC grab samples were collected, the soil remaining in the column was extruded into the glass beaker. A stainless steel spoon was used to homogenize the soil in the beaker. A composite sample from the homogenized soil in the beaker, representative of the entire length of the column, was collected for analysis of moisture content (ASTM Method D 2216), SVOCs (EPA Method 8270), EOX (EPA Method 9023), and total bacteria.

Section 5.0 Discussion and Conclusions

3. The EABR Bench Test Report does not discuss water quality parameters measured during this treatability study within the context of enhanced bioremediation processes. These parameters include oxygen-reduction potential (ORP), temperature, pH, specific conductivity, total chlorides, and EOX. These water quality parameters should provide a second line of evidence to show that decreases in contaminant and electron acceptor concentrations are directly correlated to increases in metabolic by-product concentrations and not by other non-destructive attenuation pathways. **Provide a discussion of trends in water quality parameters during the bench-scale tests.**

RESPONSE: Water quality parameters measured during the test included dissolved oxygen (DO), ORP, temperature, pH, and specific conductivity. Chloride and EOX were not measured as water quality parameters in effluent. Measurement of EOX in effluent was not proposed in the work plan. There was not enough effluent sample volume to collect chloride samples for laboratory analysis. As stated in the treatability test report on page 4-5, chloride measurement using an ion selective electrode was attempted, however readings were inconsistent due to malfunction of the probe.

Dissolved oxygen results indicate significant DO consumption in all oxygen-amended columns. Influent ORP ranged from 104 to 200 mV, while effluent values in biotic columns ranged from -63 to 122 mV. The ORP decrease across the columns is consistent with the observed decrease in DO concentrations. Effluent ORP was relatively stable throughout the test in all columns, with values typically between 20 and 100 mV. Negative ORP values were occasionally measured further indicating oxygen depletion. Decreases in DO and ORP across the columns with concomitant decreases in MCB/DCB soil concentrations provide evidence of aerobic bioremediation.

Effluent temperature ranged from 67.2 to 73.9 °F, and was relatively stable at approximately 70 °F throughout the experiment. Influent temperature was maintained at an average of 57 °F. Temperature increased across the column as the water warmed to room temperature during transport through the column.

Effluent pH ranged from 6.42 to 7.79 indicating appropriate conditions for bacterial growth. There was no significant change in pH across the column as influent values averaged 7.13. Since biotic columns were maintained under aerobic conditions, no pH change was anticipated.

Specific conductivity values measured in the effluent exhibited no trend and ranged from 2483 to 3120 uS, similar to the influent range of 2632 to 3266 uS.

Section 5.3 Conclusions

4. Bullet No. 4 states that the site's native microorganisms are not believed to be adversely affected by high concentrations of MCB and DCBs. This statement is not supported by data or evidence from similar sites. Provide any information from the testing laboratory's experience or the literature indicating the relative levels of MCB and DCBs in soil or groundwater that are known or suspected to be toxic to these species of bacteria.

RESPONSE: Multiple lines of evidence from the MHU/DHU Mass Removal Treatability Test demonstrate that microorganisms native to the site were capable of growth in areas having high levels of MCB/DCB:

- 1) MCB/DCB concentrations in treatability test soil samples were greater than historical maximums at the site, and they indicate the presence of NAPL in the columns;
- 2) No microbes were added to the soil used for the test columns, therefore any bacterial growth during the test resulted from bacteria present in samples collected from the site;
- 3) Concentrations of total bacteria and contaminant-degrading enzymes increased by factors of 100 to 1,000 during the test; and
- 4) Researchers at Rice University have identified the dominant microorganism in treated soil samples as *Rhodococcus erythropolis*. Literature reports indicate *Rhodococcus* species are well known for utilization of halogenated (and non-halogenated) aromatic compounds, including MCB and DCB, as sole carbon and energy sources (Reh fuss and Urban, 2005; Tsitko et al., 1999; Zaitsev et al., 1995). Zaitsev et al. (1995) report growth of a *Rhodococcus* species in saturated solutions of benzene; MCB; 1,3-DCB; and 1,4-DCB. The study reported microbial growth ceased at saturated solution concentrations of 4,000 mg/L MCB and 400 mg/L of the DCB compounds. Since these concentrations are well above the concentrations observed in column effluent, results from this study support the above conclusion that microorganisms native to the Krummrich site are not adversely affected by high contaminant concentrations.

This evidence clearly demonstrates that microorganisms native to the site are capable of growth in areas having high levels of MCB/DCB. Furthermore, research on chlorinated solvent bioremediation at other

sites provides further evidence that microorganisms are capable of growth proximate to NAPL source zones containing dissolved concentrations at or near solubility limits (Carr et al., 2000; Yang and McCarty, 2002; Adamson et al., 2003).

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SOLUTIA - 243



Kenneth
Bardo/R5/USEPA/US
05/26/2006 02:12 PM

To "Branchfield, Craig R" <crbran1@solutia.com>
cc
bcc
Subject RE: PCB Mobility and Migration Investigation

I understand constraints at a manufacturing facility but since the borings were installed there, I did not think you would have a problem installing monitoring wells. Our preference is to have the wells closer (rather than farther) from the PCB-contaminated area if it is your intent to assess PCB migration in groundwater. Monitoring wells should always be installed immediately downgradient of the waste management boundary area.

Let me know what you finally determine. Have a great weekend and vacation. - Ken
-----"Branchfield, Craig R" <crbran1@solutia.com> wrote: -----

To: Kenneth Bardo/R5/USEPA/US@EPA
From: "Branchfield, Craig R" <crbran1@solutia.com>
Date: 05/26/2006 01:22PM
Subject: RE: PCB Mobility and Migration Investigation

Ken,

Wanted to give you a quick update on this. There are several issues we are looking at regarding your suggestions on locations. First, the area you propose for MW-2 and 3 is very constricted from a spatial perspective, i.e. we're not sure we could get the drill rig necessary to install permanent wells into this space. We think we could get a geoprobe in (I emphasize "think" at this point) but that wouldn't be adequate unless we just went with some temporary wells. Of additional concern, there is an underground fire water line that runs through this area which we need to locate. Obviously, depending on its location that might preclude putting in MW-2 and 3 into the area you propose. Your proposal for MW-1 probably has a better chance, but there is a firewater tank in this area and apparently this area floods fairly easily, but we need to look at this issue closer.

We hope to have some answers within a week, and our goal is still to get the wells in this quarter. We're still on track for the plume stability well installation per the e-mail I sent you a few days ago.

I'll be on vacation next week, but will follow up with you when I return to let you know how things look.

Hope you have a good long weekend!

Craig

-----Original Message-----

From: Bardo.Kenneth@epamail.epa.gov [mailto:Bardo.Kenneth@epamail.epa.gov]
Sent: Monday, May 22, 2006 2:41 PM
To: Branchfield, Craig R
Cc: Johnson.Steve@epamail.epa.gov
Subject: PCB Mobility and Migration Investigation

Craig - We reviewed the May 5, 2006 Tech Memo titled "Phase II Site Investigation, PCB Mobility and Migration Investigation". The investigation presents field and laboratory results for PCBs in soil at the Former PCB Manufacturing Area that delineate the PCB-contaminated area and proposes

monitoring well locations. The following observations and comments are provided:

The areal extent of soils contaminated with PCBs >25 mg/kg is approximately 194,000 sq. ft. or 4.4 acres. This footprint appears to much larger than the original area that the Former PCB Manufacturing unit was located on.

Outside the perimeter of the 25 mg/kg total PCB contour line, PCBs (<1 mg/kg) are present in some subsurface soil composite samples taken from 10 to 15-feet below ground surface. At these locations, the deep subsurface soils are typically identified as wet sands. At sample location PMA-BS-11, PCBs at 0.64 mg/kg are identified in wet silt and sand 15 to 20-feet below ground surface.

There is one area where further sampling should be performed to accurately assess the 25 mg/kg total PCB contour line. At PMA-BS-13, there are no samples taken outside the perimeter of the 25 mg/kg total PCB contour line to confirm the proper location of the contour line.

The proposed monitoring well locations for PMA-MW-1, PMA-MW-2, and PMA-MW-3 are 140 to 160-feet downgradient from the 25 mg/kg total PCB contour line. This is too far. Install the monitoring wells slightly offset from boring locations PMA-BS-19, PMA-BS-24, and PMA-BS-25 which are located immediately outside the 25 mg/kg total PCB contour line. Based on the boring logs, groundwater in the SHU will likely be encountered in the thick, fine to medium grained, poorly graded sand layer identified from 2 to 10-feet below ground surface in this area.

Within 14 days of completion of the installation of the new monitoring well clusters, provide the well construction logs and reports to EPA.

Provide notification to EPA in writing at least 14 days prior to sampling the four new monitoring well clusters.

Provide the date that the first quarterly groundwater monitoring report is expected to be submitted.

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SOLUTIA - 244



"Branchfield, Craig R"
<crbran1@solutia.com>

06/12/2006 11:04 AM

To Kenneth Bardo/R5/USEPA/US@EPA
cc "Yare, Bruce S" <bsyare@solutia.com>
bcc

Subject

Ken,

We've taken a close look at the location of the PCB M&M wells and have the following thoughts -

1. PMA-MW-1 could be placed closer to boring PMA-BS-25. The concern we had with a nearby fire water tank turned out to not be a problem.
2. PMA-MW-2 and PMA-MW-3 are a bit more of a challenge. While you are correct that we were able to get a geoprobe in the vicinity of the soil sample locations, the Boart sonic drill rig is much different dimension wise and it is not possible for us to get it in this area in large part due to overhead utilities, but also because of the proximity of underground utilities in the area. I've attached some photos showing you the location of the utilities in relation to the soil sampling borings taken a few months ago to give you some feel for what we are talking about.

We considered using a hollow stem auger, but we think the overhead lines will still be a problem and it is still questionable whether we will have room to get the wells in near the soil boring locations anyway. There are smaller Boart sonic rigs available, but based on our discussion it will be sometime before we could get one out here (i.e. we don't think we will get a second quarter monitoring event in), and the question of overhead utilities remains. We could also install some temporary wells using a geoprobe, but URS is not recommending that path due to the length of the monitoring program (two years) and the lower quality well construction.

So with all that in mind our recommendation is to go with the locations we proposed in the work plan. While they are a little further downgradient, they are the closest locations we can identify without the interferences discussed above, and are still well within the facility fence line. If we do have a significant migration issue with PCBs we don't think the proposed locations will inhibit us from identifying it, and the plume stability wells will give us additional data which will assist in that evaluation.

Additionally, even though access is not an issue as it is for PMA-MW-1, we'd still propose going with the proposed location for this well as well. Doing so will keep the well out of a high traffic area and keep all three wells roughly equidistant from the 25 ppm line, which we feel will have more technical value then having one well at the 25 ppm line and two slightly further away.

Our plan is to begin installing the wells on Wednesday the 14th. If you want to discuss in more detail let me know and I can set up a call with Bruce and URS to discuss further with you.

Thanks

Craig

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SOLUTIA - 245



"Branchfield, Craig R"
<crbran1@solutia.com>
06/16/2006 08:38 AM

To
Subject WGK

Ken,

In an earlier e-mail you asked for some information regarding when the PCB M&M wells would be sampled as well as when we would be able to get you certain information regarding the plume stability program. Answers are below.

1. PCB M&M wells are scheduled to be sampled June 28th - June 30th.
2. We're in the process of pulling together the plume stability well boring logs and will have advance copies to you NLT June 30, possibly earlier.
3. The report for 1st Quarter Plume Stability monitoring event is due to be to me by NLT June 30. Assuming Bruce and I require no major revisions we should be able to submit the report to you for review shortly thereafter, NLT July 15.
4. The plume stability program well completion report is due to Bruce and I July 17th. This will be a summary of the drilling and well installation procedures, along with supporting information such as boring and well logs, surveying data, well development documentation. Assuming Bruce and I require no major revisions we should be able to submit that report for you to review shortly thereafter, NLT July 31.

Also, Bruce and GSI are actively working on plans for an EABR Pilot Test. Additionally, we have been having a series of internal meetings trying to put together a plan regarding how best to move forward with the project consistent with the discussions you and I had during our meeting in Chicago. Its my intention to have something together to present to you NLT mid-August which will include an EABR Pilot Test component with some "meat on the bone".

If you have any questions or concerns with the above please let me know.

Craig

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SOLUTIA - 246



Kenneth
Bardo/R5/USEPA/US
06/21/2006 03:58 PM

To crbran1@solutia.com
cc briller_dan@bah.com
bcc

Subject EABR Report

Craig - Please find attached EPA's technical review of the bench-scale treatability test of enhanced aerobic bioremediation (EABR) on SHU soil from the Former Chlorobenzenes Process Area. The EABR results were originally scheduled to be submitted with the results from the other bench-scale tests performed but were delayed due to reasons outlined in the attached technical comments document.

The results from this test were significantly inferior to the bench-scale test conducted using the in-situ thermal desorption (ISTD) technology on soil from the same aquifer and site location. The total mass reduction of chlorobenzenes was approximately 45% for MCB and ranged between 15% and 23% for the DCB isomers. In contrast, as documented in the February 2006, ISTD Treatability Study Final Report, the ISTD bench-scale test performed on saturated SHU soil resulted in mass removals of 99.989% of MCB and 99.999% of all DCB isomers. In addition, only an estimated 12% of the mass removal of chlorobenzenes during the test was attributed to biodegradation, with the remainder attributed to simple flushing. Flushing contaminant mass from the source areas is considered less desirable than destroying it in situ or removing it for ex situ destruction. It is also inconsistent with EPA policy expressed in the 1996 ANPR for RCRA Corrective Action.

The EABR bench-scale test did indicate that significant consumption of the influent dissolved oxygen occurred and key bacterial populations increased by approximately two orders of magnitude. Both of these results support a finding that biodegradation was occurring within the test system. Therefore, the EABR technology may be suitable for areas of the SHU with lower concentrations of dissolved phase chlorobenzenes (i.e., areas without DNAPL present) or as a follow-on process in a treatment train. However, Solutia has not provided sufficient justification for proceeding to an in-field pilot test of this technology. EPA requests that Solutia submit a workplan for an in-field pilot test of the ISTD technology in the saturated SHU at the Former Chlorobenzenes Process Area.

We recommend a meeting in early-July (July 6, 7, or the week of July 10) in Chicago to further discuss these comments and the path forward for completing interim remedy work at the Former Chlorobenzenes



Process Area and Former PCB Manufacturing Area. - Ken Solutia SHU EABR Comments.doc

Technical Review of the May 2006 Enhanced Aerobic Bioremediation (EABR) Treatability Test Report for the Saturated Shallow Hydrogeologic Unit, Solutia, Inc. W.G. Krummrich Facility, Sauget, Illinois

I. INTRODUCTION

Solutia conducted a bench-scale treatability test of the EABR technology on a soil sample collected from the DNAPL-impacted portion of the SHU at the W.G. Krummrich Facility. The results are summarized in the EABR Treatability Test Report for the SHU (Report). The soil test sample was collected near the location of former soil boring DNAPL K-4, in the Former Chlorobenzenes Process Area, from a depth interval of 14.5 feet below ground surface (ft bgs) to 18.5 ft bgs. Submittal of this treatability test data completes the series of treatability tests proposed in the two Bench-Scale Test Work Plans that were submitted to EPA by Solutia in May 2005. (Treatability testing also included in-situ thermal desorption [ISTD] bench-scale tests on unsaturated soil samples from the Former Polychlorinated Biphenyls [PCBs] Manufacturing Area and Former Chlorobenzenes Process Area, an ISTD bench-scale test on a saturated soil sample from the Former Chlorobenzenes Process Area, and an EABR bench-scale test on saturated soil from the Middle Hydrogeologic Unit and Deep Hydrogeologic Unit [MHU/DHU] at the Former Chlorobenzenes Process Area).

Completion of the EABR bench-scale test on saturated SHU soil from the Former Chlorobenzenes Process Area was delayed due to the following:

- Initial problems in ensuring adequate water flow through the test column (refer to General Comment No. 1 below).
- Evacuation of the testing laboratory due to Hurricane Rita.
- Plugging of the test apparatus after the test was restarted (cause unknown).

The test consisted of a four-week equilibration period during which oxygen was not added to the test column, and a 12-week period during which oxygen was added to stimulate biodegradation.

EABR relies on the stimulation of naturally-occurring bacteria within the aquifer to undertake aerobic respiration processes, resulting in degradation of monochlorobenzene (MCB) and dichlorobenzenes (DCBs). Because the rates of aerobic bioremediation processes are usually limited by a shortage of electron acceptors, oxygen (the preferred electron acceptor, in terms of energy use by the microbes) is added to accelerate the degradation reactions. The compounds of concern (COCs) act as the electron donors in the respiration process, and are ultimately degraded to carbon dioxide, water, and chloride ions if the process is completed.

The bench-scale treatability test procedures were described in the Enhanced Aerobic

Bioremediation Work Plan, Mass Removal Treatability Study, Solutia, Inc., W.G. Krummrich Facility (EABR Bench Test Work Plan) dated May 2005. In accordance with the EABR Bench Test Work Plan, the soil sample from the SHU was homogenized and loaded into a treatment column. Following an equilibration period, oxygen gas was bubbled into a deionized water stream amended with nutrients and minerals to simulate site groundwater conditions. The oxygenated water was then pumped through the test column at velocities comparable to the seepage velocity within the SHU. Soil samples were collected prior to testing, to establish baseline concentrations of COCs, and at the conclusion of the 12-week test period to evaluate the effectiveness of treatment (i.e., mass removal of MCB and DCBs). The soil samples were collected from the upstream (front), middle, and downstream (end) of each column, to evaluate any variations in treatment efficiencies along the length of the column. Samples of treatment column effluent were also collected (generally weekly) and analyzed for COCs and key geochemical parameters.

II. GENERAL COMMENTS

1. The results from the EABR bench-scale test on saturated zone soil from the SHU were disappointing and significantly inferior to the bench-scale test conducted using the ISTD technology on soil from the same aquifer and site location. This conclusion is supported by the following test data:
 - The soil collected from the SHU (primarily fine silts and clays) was impermeable to water flow at the selected flow rate when first received in the laboratory. In order to initiate the test, the laboratory remixed the sample with 75 percent soil material from the SHU and 25 percent soil material from the underlying MHU/DHU (which contained considerably more sand and gravel). The fact that this action had to be performed to ensure water flow through a sample of aquifer material, coupled with the second cessation of flow due to low permeability in the test column in late October 2005, suggests that delivery of oxygen into the SHU sufficient to ensure adequate bioremediation will not be achievable in the field. In addition, the test was not truly representative of SHU conditions, because 25 percent of the material in the test column was from the MHU/DHU.
 - The total mass reduction of chlorobenzenes, as measured by analysis of pre-test and post-test soil samples, was approximately 45 percent for MCB and ranged between 15 percent and 23 percent for the DCB isomers. Mass reductions in the front (upstream) third of the test column were high; however, the measured masses actually increased in the middle third during the test, and mass reductions were much lower in the end (downstream) third, as summarized in Table 1.

Table 1: Mass Reduction of MCB and DCBs, EABR Saturated SHU Bench-Scale Test

Column Section	MCB	1,2-DCB	1,3-DCB	1,4-DCB
Front (upstream)	99.8%	96.2%	95.9%	96.6%

Middle	-8.6%	-66.7%	-56.3%	-50%
End (downstream)	43.1%	16.7%	18.8%	23%
Total Mass Reduction	45%	15%	19%	23%

This indicates that even after a 12-week test period, oxygen was apparently not migrating to the downstream portions of the column in amounts sufficient to stimulate significant biodegradation of chlorobenzenes. The increase in downstream mass in the middle third also indicates that significant flushing and transfer of mass (i.e., rather than destruction of mass) was occurring in the column; refer to the following bullet for a more in-depth discussion of flushing.

- Section 4.5 of the Report indicates that, based on oxygen consumption data, an estimated 12 percent of the total mass of chlorobenzenes removed during the test was due to biodegradation and the remaining 88 percent was due to flushing. As noted in the previous bullet, this could explain the increase in mass of MCB and DCBs within the middle portion of the column. Additional calculations in this section indicate that for total volatile organic compound (VOC) and semi-volatile organic compound (SVOC) concentrations above the 50th percentile (i.e., the median), 100 percent of mass removal would occur due to flushing, as compared to 42.2 percent for concentrations in the 25th to 50th percentile and 7 percent for concentrations below the 25th percentile. In combination, these data imply that chlorobenzene NAPLs (and possibly also high dissolved-phase concentrations) in the saturated SHU would be removed primarily through flushing. In the May 2006 Response to EPA's Comments on the EABR Treatability Test for the MHU/DHU Report, Solutia also raises the point that "since the May 26, 2004, CA750 Environmental Indicator Determination demonstrated that groundwater migration from the site was under control, continued flushing of MCB/DCBs from the source area will not adversely impact the Mississippi River." Notwithstanding the protection afforded to the river by the downgradient Groundwater Migration Control System (GMCS or slurry wall) at Site R, flushing contaminant mass from the source areas in large amounts is less desirable than destroying it in situ or removing it for ex-situ thermal destruction, which the ISTD technology would accomplish. In addition, this approach would be inconsistent with EPA's 1996 Advanced Notice of Public Rule-making (ANPR)¹, which expresses a preference for corrective measures that reduce the toxicity, mobility, and/or volume of contaminants in source materials.

As documented in the February 2006 ISTD Treatability Study Final Report submitted by Solutia, the ISTD bench-scale test performed on soil from the same aquifer and site location resulted in mass removals of 99.989 percent of MCB and 99.999 percent of all DCB isomers (compared to 45 percent of MCB and between 15 percent and 23 percent of

¹ U.S. EPA, Corrective Action for Releases from Solid Waste Management Units at Hazardous Waste Management Facilities; Proposed Rule, Federal Register, 19431-64, May 1, 1996.

DCBs during the EABR bench-scale test). Additionally, it should be noted that these ISTD results were realized at the lowest test temperature of 100 degrees Celsius. The EABR bench-scale test did indicate that significant consumption of the influent dissolved oxygen occurred (i.e., between 86 percent and 97 percent of the initial 48.6 milligrams per liter [mg/L] influent concentration) and that key bacterial populations increased by approximately two orders of magnitude during the 12-week test. Both of these results support a finding that biodegradation was occurring within the test system. Therefore, the EABR technology may be suitable for areas of the SHU with lower concentrations of dissolved phase chlorobenzenes (i.e., no DNAPLs) or as the follow-on process in a treatment train. Nevertheless, Solutia has not provided sufficient justification to proceed to an in-field pilot test of the EABR technology for the saturated SHU at the DNAPL-impacted Former Chlorobenzenes Process Area. Based on the bench-scale test results generated to date, we request that Solutia submit a work plan for an in-field pilot test of the ISTD technology in the saturated SHU at the Former Chlorobenzenes Process Area.

2. The EABR bench-scale test for soil from the MHU/DHU included a control sample (i.e., a test column purged with nitrogen instead of oxygen and amended with a biocide to prevent biodegradation activity). From review of this Report, it is not apparent that a similar control column was set up and tested for the bench-scale test of saturated soil from the SHU. The purpose of the control sample is to investigate, and quantify if possible, attenuation of chlorobenzenes due to abiotic mechanisms (e.g., volatilization, sorption, dilution, hydrolysis). Solutia should clarify whether a control column was tested during the EABR bench-scale test on SHU soil, and if not, provide the rationale for omitting this test.
3. Two significant issues were observed during the SHU treatability study that were not noted during the corresponding EABR bench-scale test on the MHU/DHU soil. First, negative reduction (i.e., an increase) was observed in MCB and DCB masses in the middle segment of the test column over the test period. Second, there were four weeks of no-flow conditions following three weeks of oxygenation, before the flow then resumed for the rest of the test period. The Report noted that the reasons for these observations were unclear. Furthermore, these problems were not encountered during the similar treatability study on MHU and DHU soil. Solutia should amend the Report to explain or theorize why these issues were noted during the SHU bench-scale test but not during the MHU/DHU test for the same technology.

III. SPECIFIC COMMENTS

Section 1.0 Executive Summary

1. This section states that the total MCB/DCB mass removed from the saturated SHU treatability test column was 23 percent, based on soil sampling data indicating that the initial mass in the column was 3,140 mg and the residual mass in the column after 12 weeks of oxygen injection was 2,620 mg. A standard percent difference calculation $(3,140 - 2,620 / 3,140)$ indicates a mass removal of 16.6 percent. In addition, the text

indicates that the total mass removed was 95 mg via biodegradation + 695 mg via flushing = 790 mg, which when added to 2,620 mg is equal to 3,410 mg total mass (not 3,140 mg). Solutia should check the applicable calculations and correct or clarify them as necessary.

Section 2.3.3 Column Preparation and Operation

2. On page 8 in this section, the flow rate through the test column is listed as 39.6 milliliters per minute (mL/min). This flow rate seems inconsistent with simulating a groundwater velocity of only 10 feet per year, and furthermore does not correspond to the flow rate given on page 21 of the Report (0.04 L/day). Solutia should clarify and correct the text as necessary to ensure that the correct flow rate is documented.
3. On page 8, under the heading *Sampling*, the text states that following initiation of oxygen addition, effluent samples were collected weekly from each column. If this is the case, discuss how four weeks of no-flow conditions following the first three weeks of oxygen addition persisted without being noticed.

Section 3.1 Initial Soil Characterization Results


4. Due to deviations from historical maximum concentrations of MCB and DCBs in the SHU soils, the test samples were spiked with laboratory-grade MCB and DCBs to attempt to simulate those baseline historical concentrations. While the total DCBs concentration of the spiked sample was close to the historical maximum (2,520 mg per kilogram [kg] versus 2,950 mg/kg, a difference of approximately 15 percent), the MCB concentration of the spiked sample was considerably less than the historical maximum (580 mg/kg versus 1,600 mg/kg, or almost 64 percent lower). Solutia further states in this section that the 580 mg/kg concentration is generally representative of source zone concentrations measured throughout the saturated SHU at the Former Chlorobenzenes Process Area. Even if this is correct, the objective of the source zone treatment is to destroy the maximum amount of DNAPL possible from this zone in order to accelerate the remediation period for SHU groundwater. As Solutia's calculations from Appendix 10 of the Corrective Measures Study (CMS) indicate, a very large reduction in MCB/DCBs mass (greater than 90 percent) is necessary before appreciable reductions in dissolved-phase concentrations are predicted to be observed. Provide a discussion on whether any analytical techniques can be applied to predict the performance of the EABR technology if the starting concentration of MCB in the test were close or equal to the historical maximum of 1,600 mg/kg.

In addition, the text states on page 11 that results of spiked samples indicated that MCB/DCBs losses during the spiking process were negligible. The supporting data or basis for this statement was unclear. Solutia should either explain the basis for this statement or reference the data supporting this statement.

Section 4.5 Mass Removal Mechanisms

5. On page 22 in this section, the following statement is made: "MCB/DCB concentrations in column effluent indicate that sorption was not a likely abiotic removal mechanism." No supporting discussion is provided. The Report should be amended to explain the above statement. In addition, sorption is often not considered to be a removal process because it represents a temporary equilibrium state that can be reversed if aquifer conditions change, thus leading to dissolution of the sorbed compound(s).
6. The text states that the mass removal achieved in the front portion of the column would likely have been achieved in the middle and end portions had the experiment been extended. This statement is not supported by the asymptotic effluent level of oxygen and increase in the MCB and DCBs concentrations in the middle portion of the column during the 12-week test. Solutia should provide the rationale for its assertion that an extended treatability test would result in increased mass removal.
7. The calculations presented on pages 21 and 22 of the Report assumed that all available dissolved oxygen within the soil matrix was being consumed through the biodegradation of MCB and DCBs. The soil will likely contain other sources of electron donors (e.g., naturally occurring organic carbon, other contaminants) that would compete with MCB/DCBs for dissolved oxygen. Solutia should clarify its calculations and discuss the expected impact of other electron donors on the dissolved oxygen available for biodegradation of chlorobenzenes in the SHU.

SOLUTIA - 247



SOLUTIA

Solutions for a better life.

Solutia Inc.

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Tel 314-674-1000

June 30, 2006

Mr. Kenneth Bardo
U.S EPA Region V
Corrective Action Section
Enforcement Compliance Branch
77 West Jackson Boulevard DE-J9
Chicago, IL 60604-3507

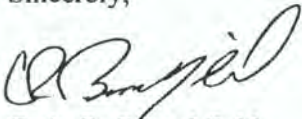
Re: PCB Mobility and Migration Phase I Investigation Report
W.G Krummrich Plant

Dear Mr. Bardo,

Enclosed please find the PCB Mobility and Migration Phase I Investigation Report for the W.G. Krummrich Facility.

If you have any questions or comment regarding the enclose report please call me at (314) 674-6768.

Sincerely,



Craig R. Branchfield
Manager, Remedial Projects

1.0 Background

PCBs are present in unsaturated soil at the Former PCB Manufacturing Area of the W.G. Krummrich Facility. Solutia prepared a work plan to address the potential mobility and migration of PCBs in the unsaturated zone soils and in groundwater beneath the site on October 21, 2005. One element of the work plan, the Phase I Site Investigation, was designed to:

- Evaluate whether or not PCBs are leaching from unsaturated soils in the Former PCB Manufacturing Area;
- Assess mass flux of PCBs leaching from the unsaturated zone to the saturated zone; and
- Determine if PCBs have migrated from the unsaturated zone to the saturated zone.

This Tech Memo presents the results of the PCB Mobility and Migration Phase I Site Investigation.

2.0 Sample Collection and Analysis

Soil Samples - Soil samples were collected in 5 ft increments from ground surface to 15 ft below ground surface (bgs) using push-sampling methods to characterize unsaturated zone soils in the Former PCB Manufacturing Area. Samples were collected from depths of 0 to 5, 5 to 10 and 10 to 15 ft bgs at previous sampling location S0835, which has the highest detected PCB concentration in the Former PCB Manufacturing Area (22,100 mg/kg), at the location shown on **Figure 1**. This location was designated PMA-S-4. Soil samples were also collected at three additional sampling locations selected by USEPA based on boring logs from site investigations performed for the August 2004 W.G. Krummrich Facility RCRA Corrective Measures Study. These boring logs are described below:

- S0822 Boring log shows that silty clay was encountered to 12' (bottom of boring), which became wet at 10'. Odors were present and the only sample obtained (9-10') found PCBs at 2,207 mg/kg.
- S0826 Boring log shows fill present from 0-8', silty clay from 8-10', and silty sand at 10'. Duplicate samples at 9-10' found PCB concentrations of 3,130 and 2,710 mg/kg. This was the only sampling point.
- S0831 Boring log shows fill from 0-10.5', silty sand from 10.5-11.5', silty clay from 11.5-14.5', and sandy silt from 14.5-16'. The only sample obtained (13-14') found PCBs at 2,030 mg/kg.

Sampling locations S0822, S0826 and S0831 have Total PCB concentrations of 2,207 mg/kg, 3,130 mg/kg and 2,030 mg/kg, respectively. These four soil sampling locations were designated PMA-S-1 (S0831), PMA-S-2 (S0826), PMA-S-3 (S0822) and PMA-S-4 (S0835).

Soil borings were advanced at the locations shown on **Figure 1** using direct push technology (Geoprobe). The Geoprobe hydraulically drove a stainless steel, acetate-lined MacroCore sampler (2-inch diameter by 4-foot length) to the desired subsurface sample depths. Continuous soil samples were collected from the surface to the planned sampling depths. The subsurface stratigraphy was logged during drilling operations by a qualified URS Corporation (URS) field scientist in accordance with the Unified Soil Classification System (USCS) protocols and URS procedures. The field scientist noted soil attributes such as color, particle size, consistency, moisture content, structure, odor (if obvious) and organic content (if visible). Soil samples from each boring were visually evaluated for evidence of impact and screened for organic vapors in the field using a photoionization detector (PID). At the completion of each soil

boring, the boreholes were backfilled with bentonite chips and asphalt patch. Soil boring logs are included in **Appendix A**.

After the soil sample was logged, sample intervals were selected for potential testing based on the presence or absence of staining on the soil sample. Samples for VOC analysis were selected based on the highest photoionization detector (PID) reading within each 5 ft sample interval and collected using Method 5035 (Closed System Purge and Trap and Extraction for Volatile Organics in Soil and Waste Samples). Dichlorobenzenes were quantitated using Method 8260B because of volatilization losses associated with Method 8270C. If there was evidence of staining or other visual indicators of waste materials, the stained portion of each 5 ft sample interval was selected for SVOC and PCB analysis. If there was no evidence of staining, each 5 ft sample interval was thoroughly homogenized before sampling. Sample containers were collected for laboratory analysis for Total and extractable VOCs, SVOCs and PCBs using USEPA Methods 8260B, 8270C and 680, respectively. USEPA Method 1312, Synthetic Precipitation Leaching Procedure (SPLP), was used to create an extract to evaluate constituent mobility after analysis by Methods 8260B (VOCs), 8270C (SVOCs) and 680 (PCBs). A total of 17 soil samples were collected. These soil samples were analyzed for Total VOCs, SVOCs and PCBs and SPLP-extractable (leachable) VOCs, SVOCs and PCBs.

Quality assurance/quality control (QA/QC) samples consisting of equipment blanks (EB), duplicates (DUP), and matrix spike/matrix spike duplicate (MS/MSD) samples were collected at a rate of 10%, 10% and 5%, respectively, and submitted to the laboratory for analysis.

For proper identification in the field and proper tracking by the analytical laboratory, investigative and QA/QC samples were labeled in a clear and consistent fashion. Sample labels were wrapped in clear tape for waterproofing and glass sample containers were sealed in plastic bubble wrap bags. A completed sample label was attached to each investigative or QC sample. The sample labels included the project name and number, sample number identification, initials of sampler, sampling location, required analysis, and date and time of sample collection.

The sample identification system for soil involved the following nomenclature "PMA-S-A-BB-CC-DDD" where:

- "PMA" denoted PCB Manufacturing Area
- "S" denoted Soil Sample
- "A" denoted
 - # - Sample location number
- "BB" denoted
 - ## - Initial depth of sample interval
- "CC" denoted
 - ## - Final depth of sample
- "DDD" denoted
 - denoted QA/QC sampling

For example, PMA-S-2-10-12-DUP indicated the soil sample was obtained from Sample Boring 2 from 10 to 12 feet below ground surface, and that the sample was a duplicate.

Samples were placed on ice inside a cooler immediately following sampling. Sampling containers were

packed in such a way as to help prevent breakage and cross-contamination. Samples were shipped in coolers, each containing ice and ice packs to maintain inside temperature at approximately 4°C. Sample coolers were then sealed between the lid and sides of the cooler with a custody seal prior to shipment. Shipping arrangements were handled by a representative of Severn Trent laboratories (STL).

Field personnel maintained a sample log book and soil boring data sheets to record information sufficient to allow reconstruction of the sample collection and handling procedures at a later time. Chain-of-custody (COC) procedures were instituted and followed throughout the sampling activities. Samples were handled according to chain-of-custody protocols; the field sampler was personally responsible for the care and custody of the sample until transferred to a representative of STL.

Field personnel recorded the project identification and number, sample description/location, required analysis, date and time of sample collection, type and matrix of sample, number of sample containers, analysis requested/comments, and sampler signature/date/time, with permanent ink on the chain-of-custody. COC forms are included in **Appendix B**.

The samples were transferred from the URS field sampler to a representative of STL in person after samples were collected and packaged for analysis. When transferring the possession of samples, the individuals relinquishing and receiving signed, dated, and noted the time on the chain-of-custody. The field sampler signed the chain-of-custody form when relinquishing custody, made a copy to keep with the field logbook, and provided the original chain-of-custody to the STL representative with the associated samples. Soil samples were shipped to STL in Savannah, Georgia on the same day they were sampled by means of an overnight courier.

Groundwater Samples - Instead of push sampling with Geoprobe rods and a mill-slotted screen as described in the work plan, temporary wells were installed instead in order to reduce turbidity levels during sampling and facilitate sample collection (e.g., more water available given low yield of formation). Temporary groundwater wells were installed at depths of 20, 30, 40, 50 and 60 (middle of screen) ft bgs at soil sampling locations PMA-S-1, PMA-S-2, PMA-S-3 and PMA-S-4. The temporary wells were constructed using 1-inch diameter Schedule-40 PVC with 5 ft screens and installed using 2-inch Geoprobe casing with an expendable tip. The groundwater sampling locations were designated PMA-GW-1 (S0831), PMA-GW-2 (S0826), PMA-GW-3 (S0822) and PMA-GW-4 (S0835).

Groundwater samples were collected from the middle of the screened interval of each temporary well using a foot-check-ball valve sampler. Each well was purged for up to four hours before sampling in order to stabilize water quality parameters and turbidity before sampling was conducted. A well was considered stable if the parameters were within the appropriate range for a minimum of twenty minutes (generally four consecutive readings).

Filtered samples were passed through the appropriate size filter using a peristaltic pump. Unfiltered and 0.45 micron filtered samples were collected and analyzed for VOCs (Method 8260B), SVOCs (Method 8270C) and PCBs (Method 680). Ten micron filtered samples were analyzed for PCBs (Method 680). Analytical results from the 10 micron filtered samples represent both the colloidal and dissolved fractions; results for the 0.45 micron filtered samples represent the dissolved fraction. The concentration of the colloidal fraction (10 to 0.45 microns) was determined by subtracting the dissolved (0.45 micron) fraction

from 10 micron fraction. A total of 60 groundwater samples were collected. Twenty groundwater samples were analyzed for unfiltered VOCs, SVOCs and PCBs, 20 groundwater samples were analyzed for 0.45 micron filtered VOCs, SVOCs and PCBs, and 20 groundwater samples were analyzed for 10 micron filtered PCBs. Groundwater sampling sheets are included in **Appendix C**.

Quality assurance/quality control (QA/QC) samples consisting of duplicates (DUP), and matrix spike/matrix spike duplicate (MS/MSD) samples were collected at a rate of 10%, 10% and 5%, respectively, and submitted to the laboratory for analysis.

The temporary wells were also used to gauge water levels after sampling. During gauging, dense non-aqueous phase liquid (DNAPL) was found in some of the temporary wells. A composite sample was collected and analyzed for VOCs (Method 8260B), SVOCs (Method 8270C) and PCBs (Method 680).

For proper identification in the field and proper tracking by the analytical laboratory, investigative and QA/QC samples were labeled in a clear and consistent fashion. Sample labels were wrapped in clear tape for waterproofing and glass sample containers were sealed in plastic bubble wrap bags. A completed sample label was attached to each investigative or QC sample. The sample labels included the project name and number, sample number identification, initials of sampler, sampling location, required analysis, and date and time of sample collection.

The sample identification system for groundwater involved the following nomenclature "PMA-GW-A-BB-CC-DDD-EEE" where:

- "PMA" denoted PCB Manufacturing Area
- "GW" denoted Groundwater Sample
- "A" denoted
 - # - Sample location number
- "BB" denoted
 - ## - Initial depth of sample interval
- "CC" denoted
 - ## - Final depth of sample
- "DDD" denoted
 - F ### - Filter size in microns
- "EEE" denoted
 - denoted QA/QC sampling

For example, PMA-GW-1-30-F10.0-DUP indicated the groundwater sample was obtained from sampling location PMA-GW-1 at 30 feet below ground surface, filtered through a 10 micron filter and that the sample was a duplicate.

Samples were placed on ice inside a cooler immediately following sampling. Sampling containers were packed in such a way as to help prevent breakage and cross-contamination. Samples were shipped in coolers, each containing ice and ice packs to maintain inside temperature at approximately 4°C. Sample coolers were then sealed between the lid and sides of the cooler with a custody seal prior to shipment.

Field personnel maintained a sample logbook and groundwater sampling data sheets to record information sufficient to allow reconstruction of the sample collection and handling procedures at a later

time. Chain-of-custody (COC) procedures were instituted and followed throughout the sampling activities. Samples were handled according to chain-of-custody protocols; the field sampler was personally responsible for the care and custody of the sample until transferred to a representative of STL.

Field personnel recorded the project identification and number, sample description/location, required analysis, date and time of sample collection, type and matrix of sample, number of sample containers, analysis requested/comments, and sampler signature/date/time, with permanent ink on the chain-of-custody. COC forms are included in **Appendix D**.

The samples were shipped by the URS field sampler to STL the same day they were sampled by means of an overnight courier. When transferring the possession of samples, the individuals relinquishing signed, dated, and noted the time on the chain-of-custody. The field sampler signed the chain-of-custody form when relinquishing custody, made a copy to keep with the field logbook, and provided the original chain-of-custody to the STL representative with the associated samples. Soil samples were shipped to STL on the same day they were sampled by means of an overnight courier.

Samples were analyzed for Total and Filtered VOCs, SVOCs and PCBs using USEPA Methods 8260B, 8270C and 680, respectively. Dichlorobenzenes were quantitated using Method 8260B because of volatilization losses associated with Method 8270C.

3.0 Data Validation

A total of 109 samples (17 investigative soil samples, 60 investigative groundwater samples, 9 field duplicates, 2 soil-sampling equipment blanks, 4 matrix spike/matrix spike duplicates and 17 trip blanks) were submitted as part of sample delivery groups (SDGs) KPS03, KPS04, KPS05, KPS06, KPS10, KPS11, KPS12 and KPS14. The number of field duplicates collected complies with the QAPP requirement of 10% of the total number of investigative samples. The number of equipment blanks collected complies with the QAPP requirement for 10% of the soil samples. Equipment blanks were not collected for the groundwater samples because disposable equipment was used to collect these samples.

Samples were validated following procedures outlined in the National Functional Guidelines for Organic Data Review, 1999. Based on the mentioned criteria, the reported results are acceptable for their intended use. Acceptable levels of accuracy and precision, based on MS/MSD, LCS, and surrogate data were achieved for these SDGs with the noted exceptions. In addition, completeness, defined to be the percentage of analytical results which are judged to be valid, including estimated (J) data, was 100 percent.

Soil analytical results are included in **Appendix E**, groundwater analytical results are included in **Appendix F** and DNAPL analytical results are included in **Appendix G**. The Data Validation Report is included in **Appendix H**.

4.0 PCB Mobility Evaluation

PCB Leaching - Soil samples were collected from four borings at the Former PCB Manufacturing Area to evaluate whether or not PCBs are leaching from unsaturated zone soils (**Figure 1**). Samples were collected from depths of 0 to 5, 5 to 10 and 10 to 15 ft bgs at sampling locations PMA-S-1 (S0831), PMA-

S-2 (S0826), PMA-S-3 (S0822) and PMA-S-4 (S0835). Total and Leachable (SPLP-extractable) PCB concentrations for each sample are presented in **Table 1** and average concentrations for each sampling depth are summarized below:

Summary of Total and Leachable PCB Concentrations in Soil Samples from Former PCB Manufacturing Area

<u>Sample Depth</u> (feet bgs)	<u>Average Total</u> <u>PCB Concentration</u> (mg/kg)	<u>Average Leachable</u> <u>PCB Concentration</u> (mg/l)
0 to 5	19,408	0.0423
5 to 10	2,392	0.0432
10 to 15	3,384	0.0175
Average	8,395	0.0343

Average Total PCB concentrations in unsaturated soil from the Former PCB Manufacturing Area range from 2,392 to 19,408 mg/kg and average 8,395. Average Leachable (SPLP-extractable) PCB concentrations range from 0.0175 to 0.0432 mg/l with the highest Leachable PCB concentrations in the 0 to 5 and 5 to 10 ft bgs samples and the lowest Leachable PCB concentration in the 10 to 15 ft bgs sample. Based on the Synthetic Precipitation Leaching Procedure extracts, PCBs are leaching from unsaturated soil in the Former PCB Manufacturing Area at an average concentration of 0.0343 mg/l (34.3 ug/l).

PCB Mass Flux - Mass flux of PCBs from unsaturated zone to the saturated zone in the Former PCB Manufacturing Area was determined using the following equation:

$$\text{Mass Flux} = (\text{Leachable Concentration}) \times (\text{Percolation Rate}) \times (\text{Surface Area of Source Materials})$$

Average leachable PCB concentration (0.0343 mg/l) was determined as described above using SPLP extracts of four samples collected from the unsaturated zone in the Former PCB Manufacturing Area. Three of these four samples were collected at locations with the highest known Total PCB concentrations in the Former PCB Manufacturing Area, with concentrations ranging from 2,207 to 22,100 mg/kg. The fourth sample was collected at the sampling location with fifth highest known Total PCB concentration (2,030 mg/kg). Using SPLP-extracts of samples collected at the highest known Total PCB concentrations within the Former PCB Manufacturing Area results in a mass flux calculation that is biased high.

A percolation rate of 7.3 inches per year (0.185 meters per year) was used in the mass flux calculation. This infiltration rate was based on HELP (Hydrologic Evaluation of Landfill Performance) modeling of Sauget Area 1 Site I, which was performed to evaluate mass flux from this former disposal area. This infiltration rate is biased high because Site I is a truck parking lot with a gravel surface while the Former PCB Manufacturing Area at the W.G. Krummrich facility is mostly paved. To eliminate this source of bias, the HELP model will be run for the Former PCB Manufacturing Area when the final PCB Mobility and Migration Investigation Report is prepared.

Surface area of the source materials (187,294 square feet or 17,407 square meters) in the Former PCB Manufacturing Area was established by using AutoCad to determine the area within the 25 mg/kg Total

PCB isoconcentration line on **Figure 1**. This surface area may be biased high because it defines the areal extent of PCB-containing soils, not the areal extent of leachable PCB-containing soils.

Inserting these inputs into the mass flux equation yields:

$$\text{Mass Flux} = \frac{(0.0343 \text{ mg/l}) \times (0.185 \text{ meters/year}) \times (17,407 \text{ square meters}) \times (1000 \text{ liters/cubic meter})}{1,000,000 \text{ mg/kg}}$$

$$\text{Mass Flux} = 0.11 \text{ kg/yr}$$

A discussed above, this mass flux estimate is biased high because: 1) the four SPLP-extract samples used to determine leachate concentration were collected at sampling locations with four of the five highest known Total PCB concentrations in the Former PCB Manufacturing Area, 2) a percolation rate from unpaved area was used to calculate mass flux while most of the Former PCB Manufacturing Area is paved and 3) the entire area within the 25 mg/kg Total PCB isocon was used to determine surface area of the source materials instead of the area with Leachable PCB concentrations. These biases result in a calculated mass flux that is likely to be one or two orders of magnitude higher than the actual mass flux.

Determination of mass flux from the unsaturated zone is a component of an overall evaluation that is designed to determine if the unsaturated zone at the Former PCB Manufacturing Area is currently contributing significant amounts of PCBs to the groundwater system. Mass flux from the unsaturated zone needs to be compared to mass flux from the saturated zone immediately beneath the Former PCB Manufacturing Area to allow determination of whether or not the unsaturated zone is a significant source of PCBs. Once the three permanent groundwater monitoring well clusters are installed downgradient of the 25 mg/kg PCB isoconcentration line as described in the October 21, 2005 Work Plan, groundwater samples can be collected and analyzed. Analytical data from these wells can then be used to calculate groundwater mass flux.

PCB Mobility - To assess PCB mobility from the unsaturated zone to the saturated zone, temporary groundwater wells were installed at depths of 20, 30, 40, 50 and 60 (middle of screen) ft bgs at soil sampling locations PMA-S-1, PMA-S-2, PMA-S-3 and PMA-S-4 (**Figure 1**). These groundwater sampling locations were designated PMA-GW-1 (S0831), PMA-GW-2 (S0826), PMA-GW-3 (S0822) and PMA-GW-4 (S0835). Total, Colloidal and Dissolved PCBs concentrations in groundwater with depth are given in **Table 2** and average concentrations summarized below:

Summary of Total, Colloidal and Dissolved PCB Concentrations in Groundwater at Former PCB Manufacturing Area

<u>Groundwater Sampling Depth</u> (feet bgs)	<u>Total PCB Concentration</u> (mg/l)	<u>Colloidal PCB Concentration</u> (mg/l)	<u>Dissolved PCB Concentration</u> (mg/l)	<u>Observed DNAPL</u>
20	27.2917	0.0911	0.0353	Yes
30	0.2990	0.0411	0.0105	Yes
40	0.0876	0.0162	0.0025	No
50	0.2179	0.0247	0.0026	Yes
60	0.0219	0.0032	0.0007	No

Total PCB concentrations in the four groundwater samples collected at a depth of 20 feet below ground surface in the Former PCB Manufacturing Area are 2.9730, 35.8300, 0.3547 and 70.0090 mg/l and the average concentration at this sampling depth is 27.2917 mg/l (**Table 2**). These samples had Total

Suspended Solids (TSS) concentrations of 120, 77, 46 and 370 mg/l, respectively. While the sample with the highest Total PCB concentration (70.0090 mg/l) also has the highest TSS concentration (370 mg/l), the sample with the second highest Total PCB concentration (35.8300 mg/l) has the second lowest TSS concentration (77 mg/l), demonstrating that there is not a consistent relationship between Total PCB concentrations and Total Suspended Solids concentrations.

Total PCB concentrations are related to Total VOC/SVOC concentrations in one of the four groundwater samples collected at a depth of 20 ft bgs (**Table 2**). The sample with the highest Total PCB concentration (70.0090 mg/l) also has the highest detected Total VOC/SVOC concentration (112.648 mg/l). However, one of the samples collected at a depth of 20 ft bgs (PMA-GW-2) has a Total VOC/SVOC concentration of 10.670 mg/l and a Total PCB concentration of 35.830 mg/l while another sample collected at this depth (PMA-GW-3) has a Total VOC/SVOC concentration of 10.373 mg/l and a Total PCB concentration of 0.3547 mg/l. These two samples demonstrate that there is not a consistent relationship between Total PCB and Total VOC/SVOC concentrations in the groundwater samples collected from a depth of 20 ft bgs.

The only apparent difference between groundwater samples collected from 20 ft bgs at PMA-GW-2 and PMA-GW-3 is the presence of 0.55 ft of DNAPL in the temporary well installed at PMA-GW-2, which has groundwater with a Total PCB concentration of 35.830 mg/l, and the absence of measured DNAPL in the temporary well installed at PMA-GW-3, which has groundwater with a Total PCB concentration of 0.3547 mg/l.

Accumulated DNAPL (0.81 ft) is also present in the temporary well at sampling location PMA-GW-4 where the Total PCB concentration in groundwater is 70.0090 mg/l. Since the two temporary wells with measured DNAPL accumulations (PMA-GW-2 and PMA-GW-4) are the two sampling locations with the highest detected Total PCB concentrations (35.8300 and 70.0090 mg/l, respectively), PCB concentrations in groundwater at a depth of 20 ft bgs are related to the presence of DNAPL.

As discussed above, measurable accumulations of DNAPL were observed at 20 feet below ground surface in GW-2 (0.55 ft) and GW-4 (0.81 ft). Measurable DNAPL accumulations were also observed at 30 feet below ground surface in GW-4 (0.93 ft) and at 50 ft bgs in GW-1 (0.42 ft), GW-2 (0.09 ft) and GW-3 (0.041 ft). A composite DNAPL sample was collected from these wells and analyzed for VOCs, SVOCs and PCBs. Analytical results are included in **Appendix G** and are summarized below:

Summary of GW-1, 2, 3 and 4 Composite DNAPL Sample Detected Constituent Analytical Results

<u>Constituent</u>	<u>Concentration</u> (mg/kg)
Total PCBs	107,996
1,2,4-Trichlorobenzene	14,000
Chlorobenzene	920

With a Total PCB concentration of 107,996 mg/kg in the composite DNAPL sample, entrainment of DNAPL during sample collection would result in high detected Total PCB concentrations in groundwater samples from temporary wells where DNAPL is present. Filtration could remove the entrained DNAPL

and that is in fact what was observed with the 70.0090 mg/l Total PCB sample, which had a Colloidal PCB concentration of 0.1110 mg/l and a Dissolved PCB concentration of 0.0024 mg/l.

Based on the lines of evidence discussed above, the most likely explanation for the Total PCB concentrations 35.830 and 70.009 mg/l detected at 20 ft bgs in the Former PCB Manufacturing Area is the presence of PCB-containing DNAPL at groundwater sampling locations PMA-GW-2 and PMA-GW-4.

The relationship between measurable accumulations of PCB-containing DNAPL and Total PCB concentrations is substantiated by the anomalously high average Total PCB concentration at a sampling depth of 50 ft bgs. Average Total PCB concentrations in groundwater samples collected from the Former PCB Manufacturing Area decrease with depth except at 50 ft bgs: 27.2917 mg/l at 20 ft bgs, 0.2990 mg/l at 30 ft bgs, 0.0876 mg/l at 40 ft bgs, 0.2179 mg/l at 50 ft bgs and 0.0219 mg/l at 60 ft bgs (**Table 2**). At 50 ft bgs, the average Total PCB concentration of 0.2179 mg/l is a factor of 2.5 higher than the 0.0876 mg/l average Total PCB concentration at 40 ft bgs.

Measurable DNAPL is present in three of the four temporary sampling wells completed at a depth of 50 ft bgs, specifically sampling locations PMA-GW-1 (0.42 ft), PMA-GW-2 (0.09 ft) and PMA-GW-3 (0.41 ft). Total PCB concentrations at sampling locations PMA-GW-1, PMA-GW-2 and PMA-GW-3 are 0.1459, 0.1122 and 0.3955 mg/l, respectively. PCBs are not detected (Detection Limit 2.4 ug/l) in the one 50 ft deep temporary well (PMA-GW-4) without a measured DNAPL accumulation. Since PCBs are only detected in the three 50 ft deep temporary sampling wells with DNAPL accumulations and they are not detected in the one temporary well without a DNAPL accumulation, PCB concentrations in groundwater at a depth of 50 ft bgs are related to the presence of PCB-containing DNAPL.

Colloidal and dissolved PCB concentrations show a similar pattern to the vertical distribution of Total PCBs with the highest concentration at 20 feet below ground surface, the lowest concentration at 60 feet below ground surface and an increase in concentration at 50 feet below ground surface (**Table 2**). Colloidal PCB concentrations are lower than Total PCB concentrations and dissolved PCB concentrations are lower than colloidal PCB concentrations at all sampling depths.

Based on the Total, Colloidal and Dissolved PCBs concentrations detected in groundwater during the Phase I Site Investigation and the observed presence of PCB-containing DNAPL below the water table, PCBs are mobile in the groundwater beneath the Former PCB Manufacturing Area.

5.0 PCB Migration Evaluation

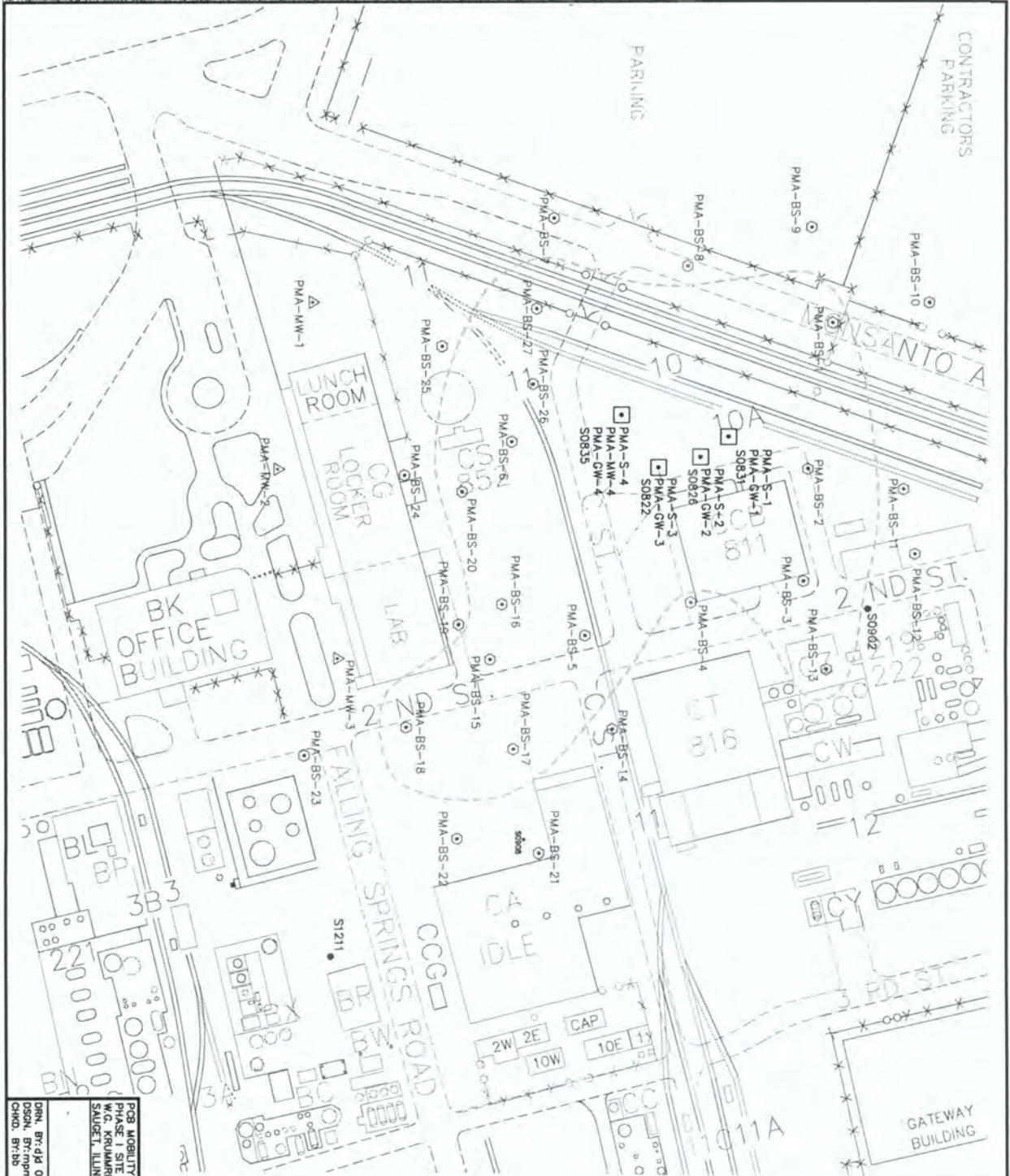
The PCB Mobility and Migration Phase III Site Investigation is currently underway as described in the October 21, 2005 Work Plan to assess whether or not PCBs are migrating in groundwater. This scope of work includes installation and sampling of three downgradient monitoring well clusters to assess the migration of PCBs in groundwater. These well clusters are located downgradient of the 25 mg/kg Total PCB isoconcentration line defined during the PCB Mobility and Migration Phase II Site Investigation. Current plans call for installation and sampling of these well clusters in June 2006. Samples will be collected for eight quarters to establish baseline groundwater conditions.

A baseline groundwater report will be prepared at the completion of two years (eight quarters) of sampling. Concentration versus time plots will be created for each monitoring well in order to depict temporal changes in the concentrations of key constituents. Analytical data from the baseline data collection period will be used to establish baseline statistical information such as normality, distribution, standard deviation, etc. The data distribution will be evaluated to determine if the data set is either normal, log normal or non-parametric. The baseline report will outline the statistical test or tests that will be used to determine if PCBs are migrating from the Former PCB Manufacturing Area via the groundwater pathway.

6.0 Attachments

Figure 1	Soil and Groundwater Sampling Locations
Table 1	Total and Leachable PCB Concentrations in Vertical-Profile Soil Samples Collected at the Former PCB Manufacturing Area, W.G. Krummrich Facility, Sauget, Illinois.
Table 2	Total, Colloidal and Dissolved PCB Concentrations in Vertical Profile Groundwater Samples from the Former PCB Manufacturing Area, W.G. Krummrich Facility, Sauget, Illinois
Appendix A	Soil Boring Logs
Appendix B	Soil Sample Chain of Custody Forms
Appendix C	Groundwater Sampling Sheets
Appendix D	Groundwater Sample Chain of Custody Forms
Appendix E	Soil Analytical Results
Appendix F	Groundwater Analytical Results
Appendix G	DNAPL Analytical Results
Appendix H	Data Validation Report

FIGURE



PCB MOBILITY AND MIGRATION INVESTIGATION -
PHASE I SITE INVESTIGATION TECH MEMO
RTO, FURNACE FACILITY
SAVING, ILLINOIS

DRN, B7: 05/03/06
DSN, B7: rmp
CHKD, B7: bbs

PROJECT NO.
21561640.00000

FIG. NO.
1

URS

Soil and Groundwater
Sampling Locations



- LEGEND**
- SOIL AND GROUNDWATER SAMPLING LOCATION FROM PCB MOBILITY AND MIGRATION INVESTIGATION
 - BOUNDARY SOIL SAMPLING LOCATION
 - △ APPROXIMATE GROUNDWATER SAMPLING LOCATIONS (MONITORING WELLS) LOCATED AT DOWN GRADIENT BOUNDARY OF 25mg/kg PCB ISOCONCENTRATION LINE IN SOIL
 - PHASE I OR PHASE II CWS BORING LOCATIONS
 - APPROXIMATE 25 mg/kg TOTAL PCB CONTOUR LINE IN SOIL

TABLES

Table 1 - Comparison of Total and Leachable PCB Concentrations in Soil Samples Collected at the Former PCB Manufacturing Area, W.G. Krummrich Facility, Sauget, Illinois

Soil Sample Depth	Total PCB Concentrations				
	PMA-S-1	PMA-S-2	PMAS-3	PMA-S-4	Average
(ft bgs)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
0 to 5	13,393	61,930	1,699	609	19,408
5 to 10	1,938	5,249	777	1,602	2,392
10 to 15	7,283	2,985	74	3,195	3,384
Average	7,538	23,388	850	1,802	8,395

Soil Sample Depth	Leachable PCB Concentrations				
	PMA-S-1	PMA-S-2	PMAS-3	PMA-S-4	Average
(ft bgs)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
0 to 5	0.0774	0.0472	0.0418	0.0028	0.0423
5 to 10	0.0059	0.0691	0.0501	0.0475	0.0432
10 to 15	0.0175	0.0285	0.0069	0.0170	0.0175
Average	0.0336	0.0483	0.0329	0.0224	0.0343

Table 2 - Total, Colloidal and Dissolved PCB Concentrations in Vertical Profile Groundwater Samples from the Former PCB Manufacturing Area, W.G. Krummrich Facility, Sauget, Illinois

Groundwater Sampling Depth (Ft. bgs)	Sampling Location	Total VOCs and SVOCs (mg/l)	Total PCBs (mg/l)	Colloidal PCBs (mg/l)	Dissolved PCBs (mg/l)	TSS (mg/l)	Measured DNAPL Thickness (feet)
20	PMA-GW-1	7.989	2.9730	0.1337	0.0316	120	0.55 ft
	PMA-GW-2	10.670	35.8300	0.1060	0.1070	77	
	PMA-GW-3	10.373	0.3547	0.0138	0.0001	46	0.81 ft
	PMA-GW-4	112.648	70.0090	0.1110	0.0024	370	
	Maximum	112.648	70.0090	0.1337	0.1070	370	
	Average	35.420	27.2917	0.0911	0.0353	153	
	Minimum	7.989	0.3547	0.0138	0.0001	46	
30	PMA-GW-1	8.790	0.1050	0.0335	0.0044	640	0.93 ft
	PMA-GW-2	7.901	0.0249	NC	0.0255	100	
	PMA-GW-3	9.491	0.9772	0.0605	0.0017	150	
	PMA-GW-4	18.289	0.0891	0.0294	ND(0.0242)	140	
	Maximum	18.289	0.9772	0.0605	0.0255	640	
	Average	11.118	0.2990	0.0411	0.0105	258	
	Minimum	7.901	0.0249	0.0294	0.0017	100	
40	PMA-GW-1	7.155	0.3172	0.0494	0.0043	25	
	PMA-GW-2	10.704	0.0143	0.0092	0.0007	8	
	PMA-GW-3	9.886	0.0154	0.0058	ND(0.0024)	1700	
	PMA-GW-4	19.525	0.0036	0.0005	ND(0.0024)	410	
	Maximum	19.525	0.3172	0.0494	0.0043	1,700	
	Average	11.818	0.0876	0.0162	0.0025	536	
	Minimum	7.155	0.0036	0.0005	0.0007	8	
50	PMA-GW-1	19.592	0.1459	0.0111	0.0066	94	0.42 ft
	PMA-GW-2	5.358	0.1122	0.0075	0.0006	250	0.09 ft
	PMA-GW-3	12.310	0.3955	0.0783	0.0029	33	0.41 ft
	PMA-GW-4	5.750	ND(0.0024)	0.0019	0.0004	10	
	Maximum	19.592	0.3955	0.0783	0.0066	250	
	Average	10.753	0.2179	0.0247	0.0026	97	
	Minimum	5.358	0.1122	0.0019	0.0004	10	
60	PMA-GW-1	9.618	0.0410	NC	0.0018	250	
	PMA-GW-2	4.467	0.0083	0.0029	0.0001	210	
	PMA-GW-3	13.328	0.0286	0.0066	0.0004	77	
	PMA-GW-4	12.222	0.0099	0.0001	0.0006	130	
	Maximum	13.328	0.0410	0.0066	0.0018	250	
	Average	9.909	0.0219	0.0032	0.0007	167	
	Minimum	4.467	0.0083	0.0001	0.0001	77	

Notes: 1) NC = Not Calculated (0.45 micron concentration > 10 micron concentration)

APPENDIX A

Soil Boring Logs

LOG OF BORING PMA-S-1

Completion
Date: 1/31/06
Casing Elevation:
Ground Elevation:

Depth in feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
5	48	44	10.0			ASPHALT	ASPHALT	<p>Medium dense, dry, brownish gray sandy gravel FILL</p> <p>Medium dense, dry, black and orange cinders and coarse sand FILL</p> <p>With black staining</p> <p>Collected sample PMA-S-1-04-05 for VOCs, SVOCs, PCBs, and SPLP VOCs, SVOCs, and PCBs</p> <p>Collected sample PMA-S-1-05-07 for VOCs, SVOCs, PCBs, and SPLP VOCs, SVOCs, and PCBs</p>
			7.5			FILL		
	48	48	24.1			CL	Medium stiff, moist, gray, low plastic CLAY (CL)	
			23.9					
10	48	48	17.1			SC	Dense, moist, blackish orange, fine to medium grained, poorly graded clayey SAND (SC)	
						CL	Medium stiff, moist, gray, low plastic silty CLAY (CL)	
						ML	Soft, moist to wet, gray sandy SILT (ML)	
			10.9			CL	Medium stiff, moist to wet, gray, low plastic silty CLAY (CL)	
15	48	48	11.6			SP	Medium dense, moist to wet, black, medium to coarse grained, poorly graded gravelly SAND (SP)	Collected sample PMA-S-1-12-13 for SVOCs, PCBs, and SPLP SVOCs, and PCBs
						ML	Soft, moist to wet, brown sandy SILT (ML)	Collected sample PMA-S-1-14-15 for VOCs, and SPLP VOCs
			61.3			SP	Medium dense, wet, brown to light gray, fine to medium grained, poorly graded SAND (SP)	
								Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 Feet bgsProject No.: 21561640Project Name: PCB Mobility & Migration InvestigationDrilling Contractor: Roberts Environmental Drilling IncorporatedDrilling method: GeoprobeLogged by: M. MillerWater Depth: None ft., After ATD hrs.

Water Depth: _____ ft., After _____ hrs.

☒ Water level at time of drilling☒ Water level after drilling☒ 3" Clear Acetate Liner☒ Hollow Stem Auger☒ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-S-2							COMPLETION Date: 2/1/06 Casing Elevation: Ground Elevation:	DESCRIPTION	NOTES
Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS			
5	48	36	3.5			ASPHALT		ASPHALT	
								Medium dense, dry, red brown, fine to medium grained, poorly graded SAND	
	48	44	17.8			FILL		Stiff, dry, brown to gray, gravelly clay FILL	Collected sample PMA-S-2-03-04 for VOCs, SVOCs, PCBs, and SPLP VOCs, SVOCs, and PCBs
								Medium dense, dry, black to red brown, fine to medium grained, poorly graded sand FILL with brick fragments and cinders	
			27.5			SC		Medium dense, dry, orange to gray, fine to medium grained, poorly graded clayey SAND (SC) trace fine gravel	
10	48	48				CL		Medium stiff, moist, dark brown, low plastic silty CLAY (CL)	Collected sample PMA-S-2-05-06 for VOCs and SPLP VOCs
			134			SC		Medium dense, gray, fine to medium grained, poorly graded clayey SAND (SC)	With black staining
						CL		Medium stiff, moist, dark brown, low plastic CLAY (CL)	
			18.4			SP		Loose, moist to wet, dark brown, fine to medium grained, poorly graded SAND (SP)	Collected sample PMA-S-2-07-09 for SVOCs, PCBs, and SPLP, SVOCs, and PCBs
						CL		Medium stiff, moist, dark brown, low plastic CLAY (CL)	
15	48	48	68.7					Medium stiff, moist, brown, fine to medium grained, poorly graded SAND (SP)	Collected sample PMA-S-2-10-12 and PMA-S-2-10-12-DUP for VOCs, and SPLP VOCs
								Trace clay	
			15.7			SP		No clay	Collected sample PMA-S-2-12-14 and PMA-2-12-14-DUP for SVOCs, PCBs, and SPLP SVOCs, and PCBs
			14.8					Becomes wet	
									Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 Feet bgsProject No.: 21561640Project Name: PCB Mobility & Migration InvestigationDrilling Contractor: Roberts Environmental Drilling IncorporatedDrilling method: GeoprobeLogged by: M. MillerWater Depth: None ft., After ATD hrs.

Water Depth: _____ ft., After _____ hrs.

☐ Water level at time of drilling☒ Water level after drilling☒ 3" Clear Acetate Liner☒ Hollow Stem Auger☐ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sample☒ Air Knife/Hand Auger Sampler

Unified Soil Classification based on field visual observations.

URS

LOG OF BORING PMA-S-3

Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/1/06 Casing Elevation: Ground Elevation:	DESCRIPTION	NOTES
5	48	40	9.6			ASPHALT		ASPHALT Medium dense, dry, brownish gray sandy gravel FILL trace concrete fragments	Collected sample PMA-S-3-02-05 for VOCs, SVOCs, PCBs, and SPLP VOCs, SVOCs, and PCBs
			9.7					Medium dense, moist, black to dark brown, fine to medium grained, poorly graded sand FILL trace fine gravel	
	48	36	9.5			FILL			Collected sample PMA-S-3-06-08 for VOCs, and SPLP VOCs With black staining
			15.2					Medium stiff, moist, dark gray, low plastic clay FILL Medium dense, moist, black, fine grained sandy gravel FILL trace clay	
	48	48	10.1					Medium stiff, moist, gray, low plastic silty CLAY (CL)	Collected sample PMA-S-3-06-09 for SVOCs, PCBs, and SPLP SVOCs, and PCBs
			13.4			CL			
15	48	36	7.3					Medium dense, moist, gray to brown, fine to medium grained, poorly graded SAND (SP)	Collected sample PMA-S-3-12-15 for SVOCs, PCBs, and SPLP SVOCs, and PCBs
			10.2			SP		Becomes wet	
									Bottom of boring at 16 ft bgs Backfilled using bentonite chips

Completion Depth: 16.00 Feet bgsProject No.: 21561640Project Name: PCB Mobility & Migration InvestigationDrilling Contractor: Roberts Environmental Drilling IncorporatedDrilling method: GeoprobeLogged by: M. MillerWater Depth: None ft., After ATD hrs.

Water Depth: _____ ft., After _____ hrs.

☒ Water level at time of drilling☒ Water level after drilling☒ 3" Clear Acetate Liner☒ Hollow Stem Auger☒ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☒ Air Knife/Hand Auger
SamplerUnified Soil Classification
based on field visual
observations.

URS

LOG OF BORING PMA-S-4								
Depth In feet	Inches Driven	Inches Recovered	PID (ppm)	Sampler Graphic	Symbol	USCS	Completion Date: 2/1/06 Casing Elevation: Ground Elevation:	
							DESCRIPTION	NOTES
5	48	44	6.9			ASPHALT	ASPHALT Medium dense, dry, brownish gray, fine to medium grained, poorly graded gravelly sand FILL	Slight black staining Collected sample PMA-S-4-02-04 for VOCs, SVOCs, PCBs, SPLP VOCs, SVOCs, and PCBs
			14.2			FILL	Medium dense, moist, black, fine to medium grained, poorly graded sand FILL	
	48	42	9.6			CL	Medium stiff, moist, blackish gray, low plastic silty CLAY (CL)	Black staining Collected sample PMA-S-4-06-08 for VOCs, SVOCs, PCBs, SPLP VOCs, SVOCs, and PCBs
			206			SP	Medium dense, moist to wet, black, fine to medium grained, poorly graded gravelly SAND (SP)	
10	48	30	171			CL	Medium stiff, moist, grayish brown, low plastic CLAY (CL)	Black staining and sheen Collected sample PMA-S-4-12-14 for VOCs, SVOCs, PCBs, SPLP VOCs, SVOCs, and PCBs
			13.0			CL	Medium stiff, moist, blackish brown, low plastic CLAY (CL)	
15	48	36	80.6			SP	Loose, moist to wet, black, fine to medium grained, poorly graded gravelly SAND (SP)	
			64.1			CL	Medium stiff, moist, blackish brown, low plastic CLAY (CL)	
						SP	Medium dense, wet, brown, fine to medium grained, poorly graded SAND (SP)	
								Bottom of boring at 16 ft bgs Backfilled using bentonite chips

CB MOBILITY.GPJ URSSSTLEV.GDT 6/21/06

Completion Depth: 16.00 Feet bgsProject No.: 21561640Project Name: PCB Mobility & Migration InvestigationDrilling Contractor: Roberts Environmental Drilling IncorporatedDrilling method: GeoprobeLogged by: M. MillerWater Depth: None ft., After ATD hrs.

Water Depth: _____ ft., After _____ hrs.

☐ Water level at time of drilling☒ Water level after drilling☒ 3" Clear Acetate Liner☒ Hollow Stem Auger☐ Roto Sonic-3" Core Barrel

ATD - At time of drilling

☒ Geoprobe Macro Sampler☒ Air Knife/Hand Auger SamplerUnified Soil Classification
based on field visual
observations.**URS**

SOLUTIA - 249

Kenneth
Bardo/R5/USEPA/US
07/11/2006 03:50 PM

To crbran1@solutia.com
cc
bcc


Subject July 20th meeting

Craig - I looked at the Phase I Site Investigation Tech Memo for the Former PCB Manufacturing Area. We would like to discuss the results at the meeting and will provide written comments later. Priscilla Fonseca from the TSCA program will be at the meeting to discuss TSCA's involvement in the RCRA corrective action program. I hope that we may have a productive discussion on how to move forward in addressing the Former PCB Manufacturing Area through interim corrective measures. Dan Briller of Booz Allen will also be at the meeting to aid in our discussion on the EABR results at the Former Chlorobenzenes Process Area. We believe that ISTD technology is a viable technology for addressing both source areas.

We also need to further discuss field pilot tests for EABR in the MHU and DHU at the Former Chlorobenzenes Process Area. As you remember, a workplan for a field pilot test was being prepared, as discussed at our last meeting, but has not yet been submitted to EPA for review and comment.

We have a full day ahead of us and hopefully we can conclude with a common path forward and agreed to schedule for submitting the necessary workplans to implement interim corrective measures at the Former PCB Manufacturing Area and Former Chlorobenzenes Process Area using ISTD and EABR technology. I am available this week if we need to discuss anything (I am out of the office next week from Monday through Wednesday). - Ken

SOLUTIA - 250



SOLUTIA

Solutions for a better life.

Solutia Inc.

575 Maryville Centre Drive
St. Louis, Missouri 63141

P.O. Box 66760

St. Louis, Missouri 63166-6760

Tel 314-674-1000

July 21, 2006

Mr. Kenneth Bardo
U.S EPA Region V
Corrective Action Section
Enforcement Compliance Branch
77 West Jackson Boulevard DE-J9
Chicago, IL 60604-3507

Re: Plume Stability Monitoring Program
1st Quarter 2006 Data Report
W.G Krummrich Plant

Dear Mr. Bardo,

Enclosed please find the Plume Stability Monitoring Program 1st Quarter 2006 Data Report for the W.G. Krummrich Facility.

If you have any questions or comment regarding the enclose report please call me at (314) 674-6768.

Sincerely,



Craig R. Branchfield
Manager, Remedial Projects

PLUME STABILITY
MONITORING PROGRAM

SOLUTIA INC.
W.G. KRUMMRICH FACILITY
SAUGET, ILLINOIS

Prepared for
Solutia Inc.
575 Maryville Centre Dr
St. Louis, Missouri 63141

July 2006

URS

URS Corporation
1001 Highland Plaza Drive West, Suite 300
St. Louis, MO 63110
(314) 429-0100
Project # 21561618

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Appendix B	Groundwater Chains-of-Custody
Appendix C	Quality Assurance Report
Appendix D	Groundwater Analytical Results

1.0 INTRODUCTION

Solutia Inc. (Solutia) is conducting groundwater monitoring activities as outlined in the September 16, 2005 Plume Stability Monitoring Plan. This report is the first of eight reports, representing quarterly sampling events that make up the "baseline" monitoring period. Solutia intends to submit data reports, such as this one, for the quarterly events that make up the baseline monitoring period.

Through the 1st quarter 2006, eleven of the nineteen planned new monitoring wells have been installed. Groundwater samples were obtained from these eleven monitoring wells in the 1st quarter. Solutia received property access to install the remaining wells during the 2nd quarter.

As described in the Plume Stability Monitoring Plan, the monitoring wells are screened at depths which represent the highest concentration of target constituents in groundwater, based on existing information. Most of the wells are screened in the Deep Hydrostratigraphic Unit (DHU); a few are screened in the Shallow Hydrostratigraphic Unit (SHU) or Middle Hydrostratigraphic Unit (MHU). The monitoring well installation report, which is currently being prepared, will provide specific information with respect to screen placement.

The monitoring wells and locations are shown below.

Well ID	Location
PSMW-1	Northern plume boundary
PSMW-2	Former PCB Manufacturing Area
PSMW-3	Former Chlorobenzene Process Area (CPA)
PSMW-4	North Tank Farm
PSMW-5	Former Chlorobenzene Storage Area (CSA)
PSMW-6	Northern Plume Boundary
PSMW-7	CPA Migration Pathway
PSMW-8	CSA Migration Pathway
PSMW-9	Southern Plume Boundary
PSMW-12	CSA Migration Pathway
PSMW-13	Southern Plume Boundary

Notes:

1. Wells PSMW-10, 11, 14, 15, 16 were not installed until the second quarter 2006.

The monitoring well locations are shown on **Figure 2**. The field sampling activities were conducted in accordance with the procedures outlined in the Plume Stability Monitoring Plan including the collection of appropriate quality assurance and quality control (QA/QC) samples.

2.0 FIELD PROCEDURES

URS Corporation (URS) conducted the first quarter field activities between March 17 and 24, 2006. The following section summarizes the field investigative procedures.

URS measured static groundwater levels and checked the wells for the presence of non-aqueous phase liquids and total depth using a Heron interface probe. This information was recorded on the individual sampling sheets included in **Appendix A**. Well gauging information will also be presented in tabular form in future data reports (i.e., once wells are surveyed).

Low-flow techniques were used for sample collection. At each monitoring well location, a submersible Monsoon[®] pump attached to polyethylene tubing was slowly lowered down the well and secured. The pump intake was set near the middle or slightly above the middle of the screened interval. The other end of the polyethylene tubing was connected to a flow-through cell which discharged into a 5-gallon plastic bucket. The pump flow rates were at or below 500 ml/min during purging. Water level measurements were initially recorded approximately every two minutes until the measurements indicated that significant drawdown was not occurring. If significant drawdown occurred, the flow rates were adjusted. Drawdown was monitored to ensure that it did not exceed 25% of the distance between the pump intake and the top of the screen (approximately 0.62 ft). Once the flow rate and drawdown were stable, field measurements were collected approximately every three to five minutes. Field measurements are presented on the groundwater purging and sampling forms, in **Appendix A**. Groundwater was considered stable when the following criteria had been met over a minimum of three successive flow-through cell volumes:

- pH - ± 0.2 units
- Specific Conductance - $\pm 3\%$
- Dissolved Oxygen (DO) - $\pm 10\%$ or ± 2 mg/L whichever is greater
- Oxidation-Reduction Potential (ORP) ± 20 mV

Once stabilization was achieved, samples were collected in the following order:

- Volatile Organic Compounds (VOCs)
- Semivolatile Organic Compounds (SVOCs)
- Pesticides
- Polychlorinated biphenyls (PCBs)
- Herbicides
- Metals

Samples for analysis of monitored natural attenuation (MNA) parameters were not collected since all of the wells comprising the plume stability network were not installed.

QA/QC samples consisting of duplicates (DUP) and matrix spike/matrix spike duplicates (MS/MSD) were collected at a rate of 10% and 5%, respectively, complying with the work plan. In addition, trip blanks

accompanied each shipment containing VOC samples. All samples were submitted to the laboratory for analysis.

The sample identification system for groundwater samples included the following nomenclature "PS2-0306" which denotes plume stability monitoring well number 2 sampled in March 2006. QA/QC samples are identified by the suffix DUP or MS/MSD.

Field personnel recorded the project identification and number, sample description/location, required analysis, date and time of sample collection, type and matrix of sample, number of sample containers, analysis requested/comments, and sampler signature/date/time, with permanent ink on the chain-of-custody (COC). COC forms are included in **Appendix B**

Samples were placed on ice inside a cooler immediately following sampling. Sample containers were packed in such a way as to help prevent breakage. Samples were shipped in coolers, each containing ice to maintain inside temperature at approximately 4°C. Sample coolers were sealed between the lid and sides of the cooler with a custody seal prior to shipment. The samples were shipped to Severn-Trent Laboratory's (STL) facility in Savannah, Georgia by means of an overnight delivery service.

3.0 LABORATORY PROCEDURES

Samples were analyzed by STL for the 40 CFR 264 Appendix IX VOCs, SVOCs, PCBs, Pesticides, Herbicides, and metals, using the following methodologies:

- VOCs, via Method 8260B
- SVOCs, via Method 8270C
- PCBs, via Method 680
- Pesticides, via Method 8081A
- Herbicides, via Method 8151A
- Metals, via Method 6010.

Dichlorobenzenes were quantitated using Method 8260B because of potential volatilization losses associated with Method 8270C. Laboratory results were provided in electronic and hard copy formats.

4.0 QUALITY ASSURANCE

Analytical data were reviewed for quality and completeness, as described in the Plume Stability Monitoring Plan. Data qualifiers were added, as appropriate, and are included on the data tables and the laboratory result pages. The Quality Assurance report is included in **Appendix C**. Laboratory result pages are included in **Appendix D**.

A total of 14 samples (11 investigative groundwater samples, 2 field duplicates and 1 MS/MSD) were prepared and analyzed by STL for VOCs, SVOCs, PCBs, Pesticides, Herbicides and metals. The results for the various analyses were submitted as sample delivery group (SDG) KPS16.

Evaluation of the analytical data followed procedures outlined in the USEPA Contract Program National Functional Guidelines for Organic Data Review, 1999 and USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, 2004. Based on the mentioned criteria, it is recommended that the results reported for the analyses performed be accepted for their intended use. Acceptable levels of accuracy and precision, based on MS/MSD, LCS, and surrogate data were achieved for this SDG to meet the project objectives. Completeness which is defined to be the percentage of analytical results which are judged to be valid, including estimated (J) data was 95 percent.

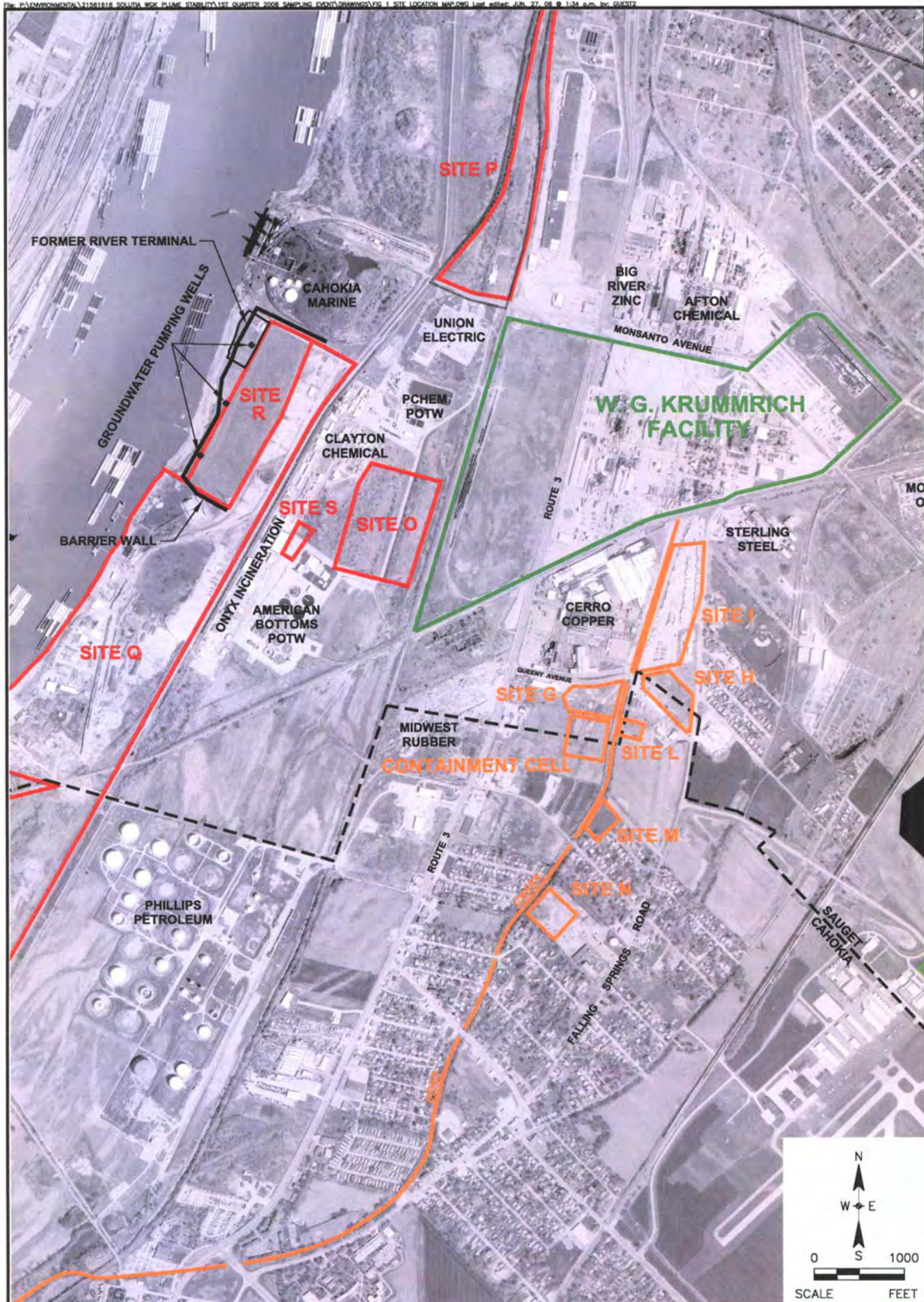
5.0 RESULTS and CONCLUSIONS

This section presents a brief summary of the groundwater analytical results from the 1st quarter sampling event. **Table 1** presents the groundwater analytical detections for the 1st quarter groundwater samples. The number and frequency of analytes detected in the monitoring wells is relatively low as compared to the analytical suite. Approximately 95% of the valid results associated with this sampling event were non-detect. The following observations are presented based on a review of these results:

- VOCs were detected in each of the wells. Benzene and chlorobenzenes (e.g., monochlorobenzene, 1,2-dichlorobenzene (DCB), 1,3-DCB, 1,4-DCB, and 1,2,4-trichlorobenzene) were detected most frequently and at the highest concentrations.
- SVOCs were detected in eight of the eleven monitoring wells. SVOCs were not detected in the northern and southern plume boundary wells. The most frequently detected SVOCs were chloroaniline and phenol.
- PCBs were detected in four of the eleven monitoring wells.
- Pesticides and Herbicides were not detected in any of the eleven monitoring wells.
- Metals were detected in each of the wells. Barium was detected in each well and zinc was detected in five of the wells. Other metals were only detected in single wells.

Figure 3 displays benzene and total chlorobenzene results from the 1st quarter sampling event. These constituents provide a good depiction of the aerial extent of constituent migration from source areas at the facility. **Figure 4** displays chloroaniline, phenol and total PCB results from the 1st Quarter sampling event. The aerial distribution of chloroaniline and phenol is within the area encompassed by the benzene and total chlorobenzene results. The aerial distribution of PCBs is generally within the boundaries of the manufacturing facility.

Solutia will continue to collect groundwater samples on a quarterly basis during the baseline monitoring period and will prepare reports similar to this. The remaining plume stability monitoring wells were installed in the 2nd quarter, and the wells were surveyed. Future quarterly reports will include sampling results from the entire plume stability well network and also include groundwater elevation contour maps. Solutia will also consider focusing the analytical program, based on the results of the 2nd quarter sampling.



LEGEND

- W.G. KRUMMRICH FACILITY
- SAUGET AREA #1
- SAUGET AREA #2

PLUME STABILITY MONITORING PROGRAM
1ST QUARTER 2006 DATA REPORT
W.G. KRUMMRICH FACILITY
SAUGET, ILLINOIS

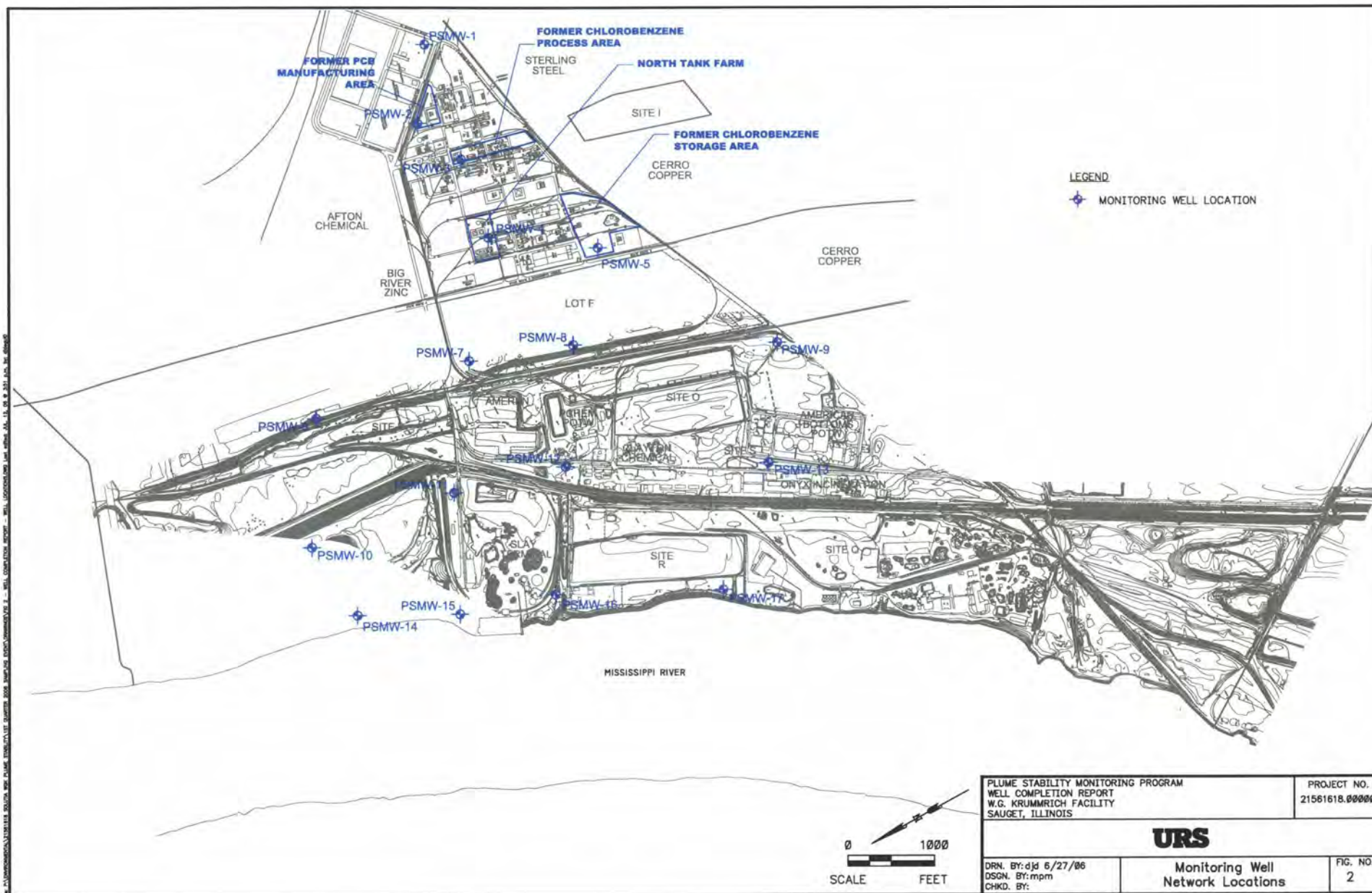
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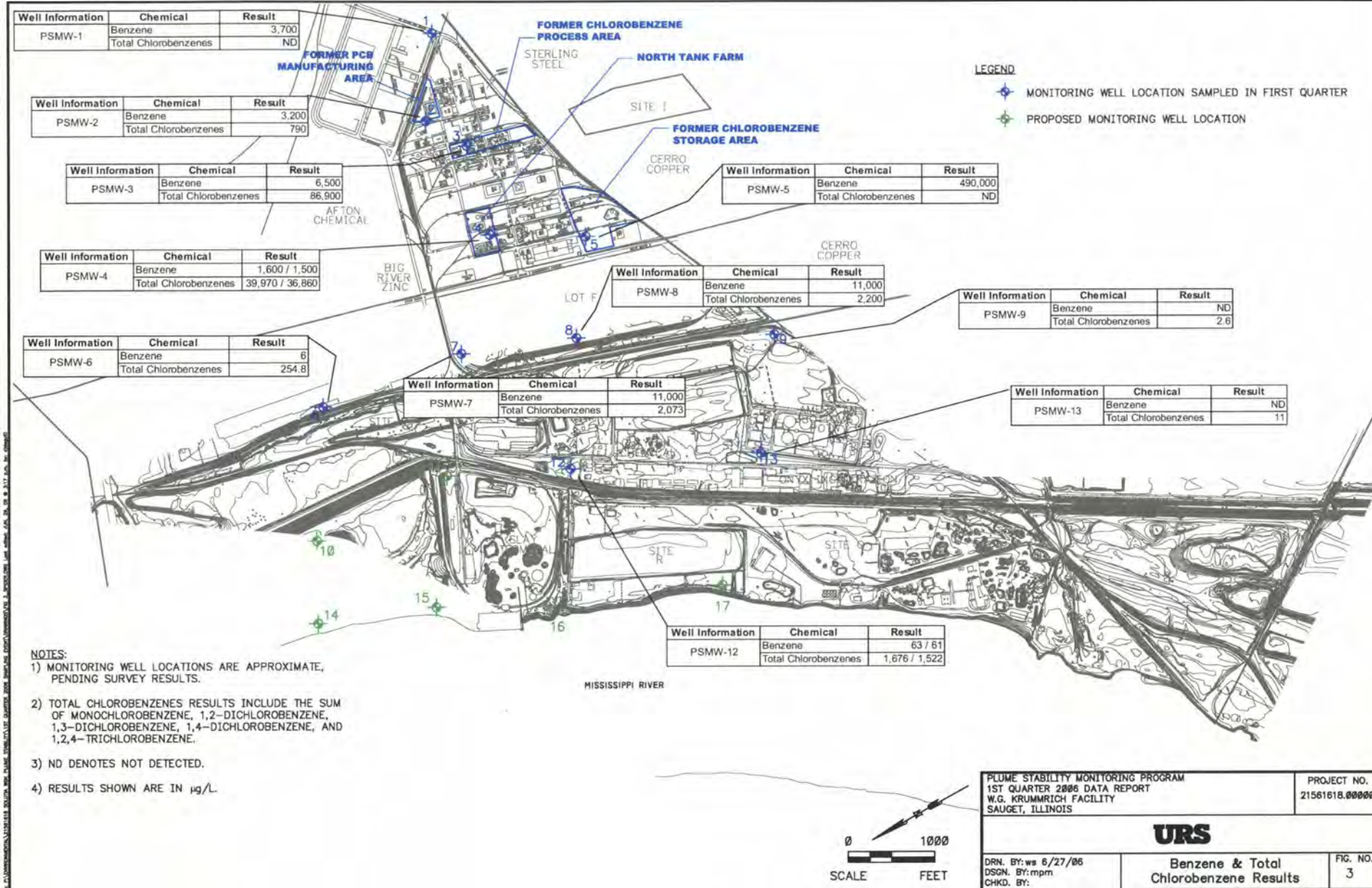
URS

DRN. BY: djd 9/22/05
DSGN. BY: tjo
CHKD. BY:

SITE LOCATION MAP

FIG. NO.
1





Well Information	Chemical	Result
PSMW-1	P-Chloroaniline	ND
	Phenol	ND
	Total PCBs	ND

Well Information	Chemical	Result
PSMW-2	P-Chloroaniline	87
	Phenol	22
	Total PCBs	0.18

Well Information	Chemical	Result
PSMW-3	P-Chloroaniline	380
	Phenol	ND
	Total PCBs	48.5

Well Information	Chemical	Result
PSMW-4	P-Chloroaniline	69 / 75
	Phenol	ND / ND
	Total PCBs	1.43 / 1.2

Well Information	Chemical	Result
PSMW-6	P-Chloroaniline	ND
	Phenol	ND
	Total PCBs	ND

Well Information	Chemical	Result
PSMW-7	P-Chloroaniline	250
	Phenol	170
	Total PCBs	ND

Well Information	Chemical	Result
PSMW-8	P-Chloroaniline	20
	Phenol	38
	Total PCBs	ND

Well Information	Chemical	Result
PSMW-9	P-Chloroaniline	ND
	Phenol	ND
	Total PCBs	ND

Well Information	Chemical	Result
PSMW-13	P-Chloroaniline	ND
	Phenol	ND
	Total PCBs	ND

Well Information	Chemical	Result
PSMW-12	P-Chloroaniline	ND / ND
	Phenol	ND / ND
	Total PCBs	16.2 / 13.73

NOTES:

- 1) MONITORING WELL LOCATIONS ARE APPROXIMATE, PENDING SURVEY RESULTS.
- 2) TOTAL PCBs RESULTS INCLUDE THE SUM OF DICHLOOROBIPHENYL, HEPTACHLOOROBIPHENYL, HEXACHLOOROBIPHENYL, MONOCHLOOROBIPHENYL, OCTACHLOOROBIPHENYL, PENTACHLOOROBIPHENYL, TETRACHLOOROBIPHENYL, AND TRICHLOROBIPHENYL.
- 3) ND DENOTES NOT DETECTED.
- 4) RESULTS SHOWN ARE IN $\mu\text{g/L}$.
- 5) TWO VALUES SHOWN, FOR CONSTITUENTS DENOTE INVESTIGATIVE AND DUPLICATE RESULTS.

FORMER CHLOROBENZENE
PROCESS AREA

FORMER PCB
MANUFACTURING
AREA

STERLING
STEEL

NORTH TANK FARM

SITE I

FORMER CHLOROBENZENE
STORAGE AREA

CERRO
COPPER

AFTON
CHEMICAL

BIG
RIVER
ZINC

CERRO
COPPER

LOT F

SITE O

SITE R

SITE Q

SITE P

SITE S

SITE T

SITE U

SITE V

SITE W

SITE X

SITE Y

SITE Z

SITE AA

SITE AB

SITE AC

SITE AD

SITE AE

SITE AF

SITE AG

SITE AH

SITE AI

SITE AJ

SITE AK

SITE AL

SITE AM

SITE AN

SITE AO

SITE AP

SITE AQ

SITE AR

SITE AS

SITE AT

SITE AU

SITE AV

SITE AW

SITE AX

SITE AY

SITE AZ

SITE BA

SITE BB

SITE BC

SITE BD

LEGEND

MONITORING WELL LOCATION SAMPLED IN FIRST QUARTER

PROPOSED MONITORING WELL LOCATION

0 1000
SCALE FEET

PLUME STABILITY MONITORING PROGRAM
1ST QUARTER 2006 DATA REPORT
W.G. KRUMMICH FACILITY
SAUGET, ILLINOIS

PROJECT NO.
21561618.00000

URS

DRN. BY: wa 7/7/06
DSGN. BY: mpm
CHKD. BY:

Chloroaniline, Phenol, and
Total PCB Results

FIG. NO.
4

See last page of table for notes.

Table 1
Groundwater Analytical Detections

Sample ID	Sample Date	Group	Chemical	Result	Units	Lab Qualifiers	URS Qualifiers
PS1-0306	3/24/06	VOCs	Benzene	3700	ug/L		
PS1-0306	3/24/06	VOCs	Ethylbenzene	1500	ug/L		
PS1-0306	3/24/06	VOCs	Toluene	300	ug/L		
PS1-0306	3/24/06	VOCs	Xylenes, Total	2100	ug/L		
PS1-0306	3/24/06	SVOCs	2,4-Dimethylphenol	64	ug/L		
PS1-0306	3/24/06	SVOCs	2-Methylnaphthalene	97	ug/L		
PS1-0306	3/24/06	SVOCs	Naphthalene	180	ug/L	D	
PS1-0306	3/24/06	Metals	Barium	1.1	mg/L		
PS1-0306	3/24/06	Metals	Barium, Dissolved	1.2	mg/L		
PS2-0306	3/24/06	VOCs	Benzene	3200	ug/L		
PS2-0306	3/24/06	VOCs	Chlorobenzene	790	ug/L		
PS2-0306	3/24/06	VOCs	Toluene	41	ug/L		
PS2-0306	3/24/06	VOCs	Xylenes, Total	120	ug/L		
PS2-0306	3/24/06	SVOCs	2-Methylnaphthalene	17	ug/L		
PS2-0306	3/24/06	SVOCs	P-Chloroaniline	87	ug/L		
PS2-0306	3/24/06	SVOCs	Phenol	22	ug/L		
PS2-0306	3/24/06	PCBs	Monochlorobiphenyl	0.16	ug/L		
PS2-0306	3/24/06	Metals	Barium	0.59	mg/L		
PS2-0306	3/24/06	Metals	Barium, Dissolved	0.58	mg/L		
PS3-0306	3/23/06	VOCs	1,2-Dichlorobenzene	39000	ug/L		
PS3-0306	3/23/06	VOCs	1,3-Dichlorobenzene	2400	ug/L		
PS3-0306	3/23/06	VOCs	1,4-Dichlorobenzene	20000	ug/L		
PS3-0306	3/23/06	VOCs	Benzene	6500	ug/L		
PS3-0306	3/23/06	VOCs	Chlorobenzene	24000	ug/L		
PS3-0306	3/23/06	SVOCs	1,2,4-Trichlorobenzene	1500	ug/L	D	
PS3-0306	3/23/06	SVOCs	4-Aminobiphenyl	100	ug/L	D	
PS3-0306	3/23/06	SVOCs	P-Chloroaniline	380	ug/L	D	
PS3-0306	3/23/06	PCBs	Dichlorobiphenyl	3	ug/L		
PS3-0306	3/23/06	PCBs	Heptachlorobiphenyl	6.8	ug/L		
PS3-0306	3/23/06	PCBs	Hexachlorobiphenyl	11	ug/L		
PS3-0306	3/23/06	PCBs	Monochlorobiphenyl	2	ug/L		
PS3-0306	3/23/06	PCBs	Octachlorobiphenyl	1.4	ug/L		
PS3-0306	3/23/06	PCBs	Pentachlorobiphenyl	11	ug/L		
PS3-0306	3/23/06	PCBs	Tetrachlorobiphenyl	10	ug/L		
PS3-0306	3/23/06	PCBs	Trichlorobiphenyl	3.3	ug/L		
PS3-0306	3/23/06	Metals	Barium	0.25	mg/L		
PS3-0306	3/23/06	Metals	Barium, Dissolved	0.082	mg/L		
PS3-0306	3/23/06	Metals	Vanadium	0.051	mg/L		
PS3-0306	3/23/06	Metals	Vanadium, Dissolved	0.025	mg/L		
PS3-0306	3/23/06	Metals	Zinc	0.036	mg/L		
PS4-0306	3/23/06	VOCs	1,2-Dichlorobenzene	1200	ug/L	D	
PS4-0306	3/23/06	VOCs	1,3-Dichlorobenzene	370	ug/L	D	
PS4-0306	3/23/06	VOCs	1,4-Dichlorobenzene	8400	ug/L	D	
PS4-0306	3/23/06	VOCs	Benzene	1600	ug/L	D	
PS4-0306	3/23/06	VOCs	Chlorobenzene	30000	ug/L	D	
PS4-0306	3/23/06	SVOCs	2-Chlorophenol	21	ug/L		
PS4-0306	3/23/06	SVOCs	P-Chloroaniline	69	ug/L		
PS4-0306	3/23/06	PCBs	Dichlorobiphenyl	0.13	ug/L		
PS4-0306	3/23/06	PCBs	Monochlorobiphenyl	1.3	ug/L		
PS4-0306	3/23/06	Metals	Barium	0.94	mg/L		
PS4-0306	3/23/06	Metals	Barium, Dissolved	0.95	mg/L		
PS4-0306	3/23/06	Metals	Zinc	0.026	mg/L		

See last page of table for notes.

Table 1
Groundwater Analytical Detections

Sample ID	Sample Date	Group	Chemical	Result	Units	Lab Qualifiers	URS Qualifiers
PS4-0306-DUP	3/23/06	VOCs	1,2-Dichlorobenzene	1400	ug/L	D	
PS4-0306-DUP	3/23/06	VOCs	1,3-Dichlorobenzene	360	ug/L	D	
PS4-0306-DUP	3/23/06	VOCs	1,4-Dichlorobenzene	8100	ug/L	D	
PS4-0306-DUP	3/23/06	VOCs	Benzene	1500	ug/L	D	
PS4-0306-DUP	3/23/06	VOCs	Chlorobenzene	27000	ug/L	D	
PS4-0306-DUP	3/23/06	SVOCs	2-Chlorophenol	26	ug/L		
PS4-0306-DUP	3/23/06	SVOCs	P-Chloroaniline	75	ug/L		
PS4-0306-DUP	3/23/06	PCBs	Dichlorobiphenyl	0.1	ug/L		
PS4-0306-DUP	3/23/06	PCBs	Monochlorobiphenyl	1.1	ug/L		
PS4-0306-DUP	3/23/06	Metals	Barium	0.96	mg/L		
PS4-0306-DUP	3/23/06	Metals	Barium, Dissolved	0.85	mg/L		
PS4-0306-DUP	3/23/06	Metals	Zinc	0.034	mg/L		
PS5-0306	3/23/06	VOCs	Benzene	490000	ug/L		
PS5-0306	3/23/06	SVOCs	2-Methylnaphthalene	12	ug/L		
PS5-0306	3/23/06	SVOCs	Naphthalene	28	ug/L		
PS5-0306	3/23/06	SVOCs	Phenol	140	ug/L		
PS5-0306	3/23/06	Metals	Arsenic	0.012	mg/L		
PS5-0306	3/23/06	Metals	Arsenic, Dissolved	0.013	mg/L		
PS5-0306	3/23/06	Metals	Barium	0.44	mg/L		
PS5-0306	3/23/06	Metals	Barium, Dissolved	0.43	mg/L		
PS6-0306	3/17/06	VOCs	1,2-Dichlorobenzene	3.5	ug/L		
PS6-0306	3/17/06	VOCs	1,3-Dichlorobenzene	1.3	ug/L		
PS6-0306	3/17/06	VOCs	1,4-Dichlorobenzene	40	ug/L		
PS6-0306	3/17/06	VOCs	Benzene	6	ug/L		
PS6-0306	3/17/06	VOCs	Chlorobenzene	210	ug/L	D	
PS6-0306	3/17/06	Metals	Barium	0.055	mg/L		
PS6-0306	3/17/06	Metals	Barium, Dissolved	0.057	mg/L		
PS6-0306	3/17/06	Metals	Cobalt	0.058	mg/L		
PS6-0306	3/17/06	Metals	Cobalt, Dissolved	0.061	mg/L		
PS6-0306	3/17/06	Metals	Copper	0.026	mg/L		
PS6-0306	3/17/06	Metals	Zinc	36	mg/L		
PS6-0306	3/17/06	Metals	Zinc, Dissolved	38	mg/L		
PS7-0306	3/20/06	VOCs	1,2-Dichlorobenzene	97	ug/L		
PS7-0306	3/20/06	VOCs	1,3-Dichlorobenzene	26	ug/L		
PS7-0306	3/20/06	VOCs	1,4-Dichlorobenzene	550	ug/L		
PS7-0306	3/20/06	VOCs	Benzene	11000	ug/L	D	
PS7-0306	3/20/06	VOCs	Chlorobenzene	1400	ug/L		
PS7-0306	3/20/06	SVOCs	P-Chloroaniline	250	ug/L	D	
PS7-0306	3/20/06	SVOCs	Phenol	170	ug/L		
PS7-0306	3/20/06	Metals	Barium	1.3	mg/L		
PS7-0306	3/20/06	Metals	Barium, Dissolved	1.2	mg/L		
PS8-0306	3/22/06	VOCs	1,4-Dichlorobenzene	100	ug/L		
PS8-0306	3/22/06	VOCs	Benzene	11000	ug/L		
PS8-0306	3/22/06	VOCs	Chlorobenzene	2100	ug/L		
PS8-0306	3/22/06	SVOCs	P-Chloroaniline	20	ug/L		
PS8-0306	3/22/06	SVOCs	Phenol	38	ug/L		
PS8-0306	3/22/06	Metals	Barium	0.38	mg/L		
PS8-0306	3/22/06	Metals	Barium, Dissolved	0.44	mg/L		
PS8-0306	3/22/06	Metals	Zinc	0.03	mg/L		
PS9-0306	3/17/06	VOCs	Chlorobenzene	2.6	ug/L		
PS9-0306	3/17/06	Metals	Barium	0.078	mg/L		
PS9-0306	3/17/06	Metals	Barium, Dissolved	0.076	mg/L		

See last page of table for notes.

Table 1
Groundwater Analytical Detections

Sample ID	Sample Date	Group	Chemical	Result	Units	Lab Qualifiers	URS Qualifiers
PS12-0306	3/22/06	VOCs	1,2-Dichlorobenzene	28	ug/L		
PS12-0306	3/22/06	VOCs	1,3-Dichlorobenzene	28	ug/L		
PS12-0306	3/22/06	VOCs	1,4-Dichlorobenzene	520	ug/L	D	
PS12-0306	3/22/06	VOCs	Benzene	63	ug/L		
PS12-0306	3/22/06	VOCs	Chlorobenzene	1100	ug/L	D	
PS12-0306	3/22/06	VOCs	cis-1,2-Dichloroethene	4.6	ug/L		
PS12-0306	3/22/06	VOCs	Toluene	2	ug/L		
PS12-0306	3/22/06	VOCs	Vinyl chloride	58	ug/L		
PS12-0306	3/22/06	SVOCs	2-Chlorophenol	10	ug/L		
PS12-0306	3/22/06	SVOCs	N-Nitrosodiphenylamine	11	ug/L		
PS12-0306	3/22/06	PCBs	Dichlorobiphenyl	3.7	ug/L		
PS12-0306	3/22/06	PCBs	Monochlorobiphenyl	12	ug/L		
PS12-0306	3/22/06	PCBs	Trichlorobiphenyl	0.5	ug/L		
PS12-0306	3/22/06	Metals	Barium	0.072	mg/L		
PS12-0306	3/22/06	Metals	Barium, Dissolved	0.07	mg/L		
PS12-0306-DUP	3/22/06	VOCs	1,1-Dichloroethane	3.1	ug/L		
PS12-0306-DUP	3/22/06	VOCs	1,2-Dichlorobenzene	26	ug/L		
PS12-0306-DUP	3/22/06	VOCs	1,3-Dichlorobenzene	26	ug/L		
PS12-0306-DUP	3/22/06	VOCs	1,4-Dichlorobenzene	470	ug/L	D	
PS12-0306-DUP	3/22/06	VOCs	Benzene	61	ug/L		
PS12-0306-DUP	3/22/06	VOCs	Chlorobenzene	1000	ug/L	D	
PS12-0306-DUP	3/22/06	VOCs	cis-1,2-Dichloroethene	4.2	ug/L		
PS12-0306-DUP	3/22/06	VOCs	Toluene	2	ug/L		
PS12-0306-DUP	3/22/06	VOCs	Vinyl chloride	59	ug/L		
PS12-0306-DUP	3/22/06	SVOCs	2-Chlorophenol	9.9	ug/L		
PS12-0306-DUP	3/22/06	PCBs	Dichlorobiphenyl	4.6	ug/L		
PS12-0306-DUP	3/22/06	PCBs	Monochlorobiphenyl	8.6	ug/L		
PS12-0306-DUP	3/22/06	PCBs	Trichlorobiphenyl	0.53	ug/L		
PS12-0306-DUP	3/22/06	Metals	Barium	0.072	mg/L		
PS12-0306-DUP	3/22/06	Metals	Barium, Dissolved	0.07	mg/L		
PS13-0306	3/22/06	VOCs	Chlorobenzene	11	ug/L		
PS13-0306	3/22/06	Metals	Barium	0.1	mg/L		
PS13-0306	3/22/06	Metals	Barium, Dissolved	0.095	mg/L		
PS13-0306	3/22/06	Metals	Chromium	0.012	mg/L		
PS13-0306	3/22/06	Metals	Zinc	0.026	mg/L		
PS13-0306	3/22/06	Metals	Zinc, Dissolved	0.021	mg/L		


Notes:

D - Diluted sample

mg/L - milligrams per liter

ug/L - micrograms per liter

SOLUTIA - 251



SOLUTIA

Solutions for a better life.

Solutia Inc.

575 Maryville Centre Drive
St. Louis, Missouri 63141

P.O. Box 66760

St. Louis, Missouri 63166-6760

Tel 314-674-1000

July 25, 2006

Mr. Kenneth Bardo
U.S EPA Region V
Corrective Action Section
Enforcement Compliance Branch
77 West Jackson Boulevard DE-J9
Chicago, IL 60604-3507

Re: Solutia Inc. Sale of Lot F
W.G. Krummrich Facility

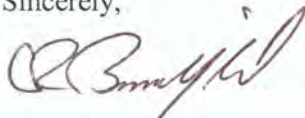
Dear Mr. Bardo,

In accordance with Section III.2 of the Administrative Order on Consent for the W.G. Krummrich Facility in Sauget, Illinois, between Solutia Inc. (Solutia) and the United States Environmental Protection Agency (EPA), Solutia hereby notifies EPA that on July 14, 2006, it entered into a Sales Agreement with Center Ethanol Company, LLC for the sale of a portion of Lot F at the W.G. Krummrich Facility, as shown on the attached photograph.

Center Ethanol Company was notified of the existing AOC between Solutia and EPA and the ongoing investigations on Lot F. The Sales Agreement provides for Solutia to retain sole responsibility for the work to be performed under the AOC, and notifies Center Ethanol Company that future remedial actions on Lot F may include institutional controls, and that such institutional controls "run" with the land. Solutia also retains access rights to the property for the conduct of this work. Additionally, Center Ethanol Company agrees to cooperate with Solutia in the design and construction of the ethanol facility to minimize disturbance of contaminated groundwater and, if it exists, soil on Lot F, and to properly manage resulting waste materials if any are generated.

If you have any questions regarding this Sales Agreement please call me at (314) 674-6768.

Sincerely,

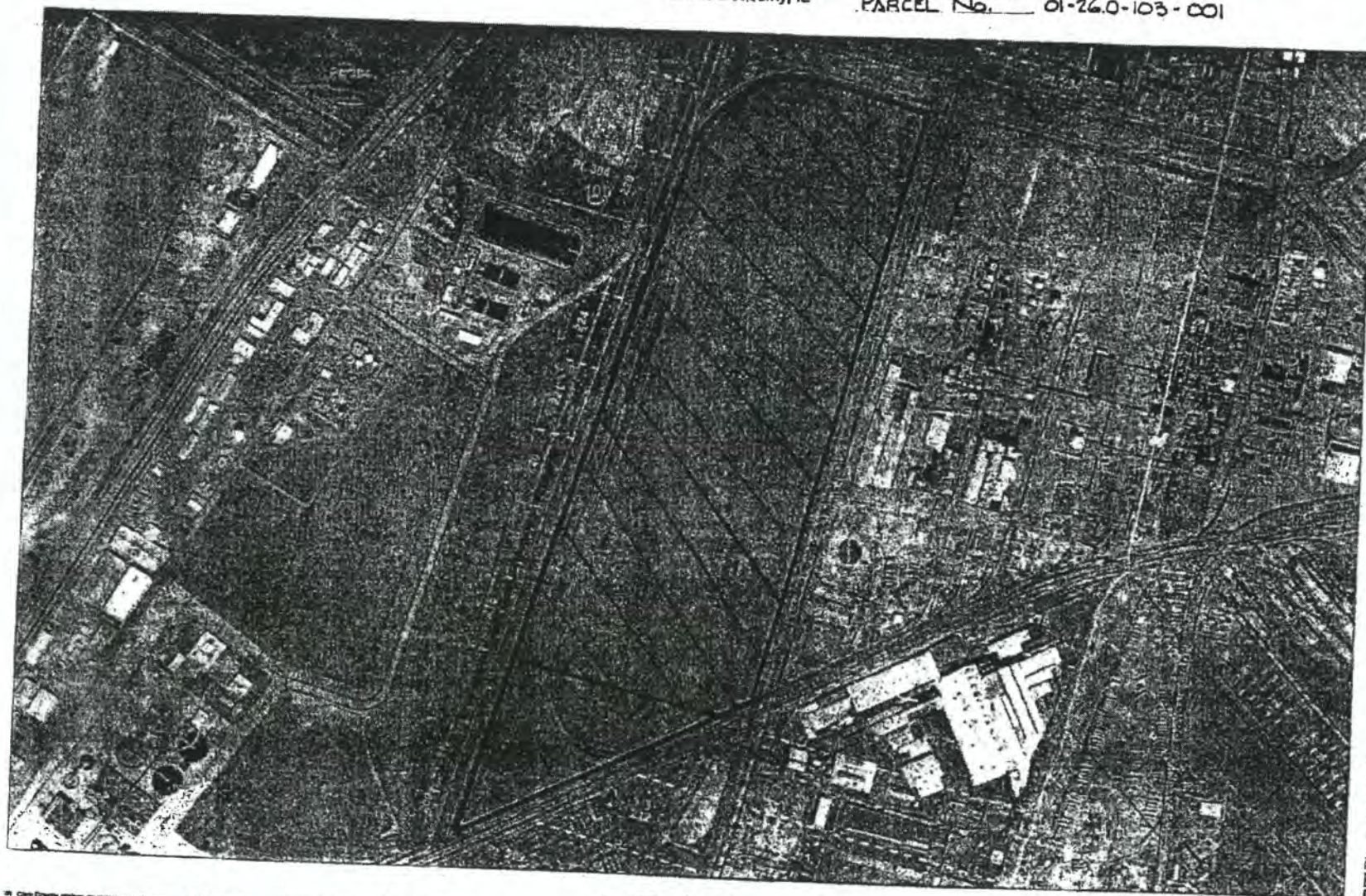


Craig R. Branchfield
Manager, Remedial Projects

Exhibit

St. Clair County, IL

PARCEL No. 01-26.0-103-001



Legend

- water ways
- centerline
- easement route
- easement area
- road right of way
- crop line
- parcel
- edge
- easement boundary
- township boundary
- section line
- railroad

St. Clair County neither warrants nor makes any representation as to the accuracy or reliability of the information shown on this map.

LOT "F" 73.7 A

1 inch equals 393.369571 feet

SOLUTIA - 253

Kenneth
Bardo/R5/USEPA/US
07/31/2006 03:30 PM

To crbran1@solutia.com
cc '
bcc

Subject PCB M&M Tech Memo Comments

Craig - Attached are comments and observations on the June 30, 2006, PCB Mobility and Migration Phase I Site Investigation Tech Memo. If time allows, we can discuss these at the August 11th meeting in Chicago. - Ken



Solutia PCB M&M Comments.doc

EPA Comments on the June 30, 2006, PCB Mobility and Migration Phase I Site Investigation Tech Memo

The Tech Memo presents results of the Phase I PCB Mobility and Migration Investigation at the Solutia, Inc., W.G. Krummrich Facility in Sauget, Illinois. The scope of work was outlined in the final revised PCB Mobility and Migration Investigation Work Plan submitted on October 21, 2005.

General Comments

1. The primary objectives of the Phase I investigation were to calculate the rate at which polychlorinated biphenyls (PCBs) in the unsaturated zone are potentially leaching into the underlying aquifers, and to assess current groundwater concentrations in the Former PCB Manufacturing Area. However, the amount of PCBs migrating as leachate may be insignificant when compared to the amount of PCBs dissolving into groundwater from dense, non-aqueous phase liquid (DNAPL) already present within the saturated zone. Evidence of DNAPL was detected in at least three groundwater sampling locations in the Former PCB Manufacturing Area. Assessment of DNAPL within the saturated zone was not included in the subsequent phases of the PCB Mobility and Migration Investigation Work Plan, and the Work Plan did not specify a course of action if DNAPL were encountered.

Explain how the remainder of the investigation will be performed considering the presence of DNAPL and high dissolved concentrations of PCBs in the shallow hydrogeologic unit (SHU). The nature and extent of DNAPL and dissolved-phase concentrations within the saturated zone (including the middle and deep hydrogeologic units [MHU/DHU]) should be properly assessed and characterized, regardless of the degree of leaching from the unsaturated zone to the saturated zone.

2. The measured concentrations in groundwater alone are sufficient to validate that PCBs have migrated to the saturated zone. If migration due to percolation through the sources in the unsaturated zone is indeed small due to the large percentage of paved surface area, the major transport mechanism would be fluctuation of the water table causing DNAPL to partition into groundwater and smearing a wider area of the unsaturated zone. The proposed mass flux calculation does not account for re-saturation and subsequent dissolution of PCB in the unsaturated zone (either adsorbed on soil or as a component of residual DNAPL) due to fluctuations in water table. Correct the calculation procedure to incorporate best estimates of the influence of changing water table elevations on PCBs in groundwater.
3. The Tech Memo does not include the following information:
 - Boring logs and well completion diagrams for all the temporary wells installed;

- Figures showing the estimated distribution of dissolved-phase PCBs in groundwater at various depths to graphically illustrate the vertical and lateral extent of dissolved PCBs in groundwater at the site (based on the data from the temporary wells);
- A table listing the water-table elevation measurements taken at the temporary wells and a figure showing generalized water-table contours and gradient directions derived from those measurements; and
- An isopach or other map showing the interpreted extent of the DNAPL phase.

The information listed above is integral in assessing the groundwater data and should be provided as an addendum to the Tech Memo.

Specific Comments

1. **Section 2.0, page 1:** Soil samples were collected from depths of 0 to 5 feet below ground surface (bgs), 5 to 10 feet bgs, and 10 to 15 feet bgs at sampling locations S0822, S0826, S0831, and S0835. This section listed the total PCB concentrations at sampling locations S0822, S0826, and S0831 at 2,207 mg/kg, 3,130 mg/kg, and 2,030 mg/kg, respectively. The listed total PCB concentrations exclude that of S0835 and are inconsistent with the total PCB values in Table 1. It appears the concentrations and soil lithology described in this section were copied from the final revised PCB Mobility and Migration Investigation Work Plan and therefore describe results from Phase I of the Corrective Measures Study (CMS). The text also includes a statement that S0835 has the highest detected PCB concentration. This statement is inaccurate because 22,100 mg/kg was detected at S0825 during the CMS (refer to Figure 1 of the Work Plan). Revise this section to address the comments above and clarify that results presented are from previous investigations used to locate the four new soil borings. Also identify how close the new borings were installed from the old borings and compare descriptions of the geological profiles at these locations with the soil boring logs attached in the report.
2. **Section 2.0, page 2:** The Tech Memo does not provide a discussion of staining or visual evidence of DNAPL noted in the soil samples. "Black staining" and "sheen" is noted in the boring logs for PMA-S-1 to S-4. Include a discussion of visual observations and identify the sample intervals that were collected based on visual indicators of DNAPL.
3. **Section 2.0, page 3:** The text states that temporary wells were installed, instead of direct push sampling as specified in the final revised PCB Mobility and Migration Investigation Work Plan, to reduce turbidity levels during sampling and facilitate timely sample collection. The Work Plan had accounted for possible turbidity in samples and had specified the collection and analysis of both filtered and unfiltered samples to account for suspended solids. Provide a discussion of any new information or specific field conditions that prompted the change in the sampling strategy for groundwater.
4. **Section 2.0, page 4:** A composite DNAPL sample was collected and analyzed for VOCs

by EPA Method 8260B, SVOCs by Method 8270C, and PCBs (homologs) by Method 680, but Section 3.0, page 5 does not include a discussion of the composite sample. Provide a description of how the compositing was accomplished, and verify that the results for the composite sample were included and validated as part of the 109 samples collected during this investigation.

5. **Section 4.0, page 6:** In the fourth paragraph, the concentrations of total PCBs are indicated to range from 2,207 mg/kg to 22,100 mg/kg. This range appears to be incorrect, because it represents older data from the CMS investigation. Provide the correct range of concentrations measured during the Phase I investigation, based on the data contained in Table 1.
6. **Section 4.0, pages 6 and 7:** The mass flux calculation is unrealistic because it does not account for the migration of PCBs as DNAPL. The use of SPLP-extractable PCBs and the HELP model would not be relevant because of the presence and migration of DNAPL in groundwater, and a fluctuating water table causing DNAPL to partition into groundwater and smearing a wider area of the unsaturated zone. The limitations of mass flux analysis should be provided in the text. Also, impacts from leaky sewers contributing additional water infiltration should be investigated and determined.
7. **Section 4.0, page 7:** The measured total PCB concentrations in four groundwater samples collected at 20 ft bgs are significantly higher than known water solubilities (e.g., Aroclor-1242 = 450 ppb, Aroclor-1254 = 12 ppb, and Aroclor-1260 = 2.7 ppb) and are three to four orders of magnitude higher than the colloidal and dissolved PCB concentrations. These concentrations are likely due to DNAPL (PCB oil) present in groundwater during collection and subsequent extraction of the samples. Groundwater and DNAPL fractions should be analyzed separately, because of the high bias introduced by DNAPL globules in a water sample. If there are positive indications of DNAPL in a monitoring well, it should not be sampled, and groundwater should be characterized using another well (e.g., downgradient) where DNAPL is not present. Solutia should make this adjustment for future sampling events in the Former PCB Manufacturing Area.
8. **Section 4.0, page 7:** The final revised PCB Mobility and Migration Investigation Work Plan specified that groundwater samples were to be collected from the top of the saturated zone to the base of the MHU on 10-foot depth intervals. Specify if the temporary wells at each of the four locations were extended to the top of the MHU, as specified in the Work Plan, and if the first screened interval coincided with the top of the saturated zone.
9. **Section 4.0, page 8:** Based on the current investigation findings, the comparison and analysis of possible relationships between total suspended solids (TSS) and detected PCBs are less important, as the elevated total PCB detections are most likely due to the presence of DNAPL globules and not PCB adsorbed on suspended solids. This observation should be clearly indicated in the report.
10. **Section 4.0, page 8:** As discussed in the report, the composite DNAPL sample consisted of approximately 11 % total PCBs, 1.4 % 1,2,4-trichlorobenzene, and 0.1%


monochlorobenzene. There is no discussion of the remaining 87 percent of the DNAPL sample analyzed. Discuss all the constituents of the composite sample, including any tentatively identified compound (TICs).

11. **Section 5.0, page 9:** The report concludes that total PCB concentrations in groundwater at 50 ft bgs are related to the presence of PCB-containing DNAPL. However, PCBs were detected in most of the groundwater samples collected at the Former PCB Manufacturing Area, whether or not DNAPL was measured in the well (refer to Table 2 of the report). For example, the highest two total PCB concentrations in well GW-1 (2.973 mg/l at 20 ft bgs and 0.3172 mg/l at 40 ft bgs) were not accompanied by measurable DNAPL. Discuss the possibility that these samples also contained emulsified DNAPL even though DNAPL did not accumulate in the wells.
12. **Section 5.0, page 10:** A baseline groundwater report is proposed after two years (eight quarters of data) from the downgradient well clusters. This data is relevant for assessing trends in contaminant concentrations in groundwater but is not necessary for assessing interim measures for the Former PCB Manufacturing Area. Previous meetings and discussions have focused on in-situ thermal desorption (ISTD) technology for the area which is supported by bench-scale testing. A field pilot test is the next logical step for further assessing ISTD technology to address the PCB source area.

Observations

- Significant concentrations of VOCs and SVOCs are also detected in soil and groundwater at the Former PCB Manufacturing Area. Monochlorobenzene, dichlorobenzenes, ethylbenzene, 1,2,4-trichlorobenzene, 1,2,4,5-tetrachlorobenzene, pentachlorobenzene, nitrophenols, and nitrobenzene are also migrating from soil to groundwater. Discuss the possibility that PCBs become more mobile in the presence of these VOCs and SVOCs.
- Soil, DNAPL, and groundwater data for PCB homologs was evaluated. Total PCBs in soil are comprised mostly of tetra- to heptachlorobiphenyl which are 84% of the total mass. Similarly, the mass of total PCBs in DNAPL and groundwater is comprised mostly of tetra- to heptachlorobiphenyl, being 89% and 85%, respectively. However, with increasing groundwater depth down to 60', colloidal and dissolved PCBs appear to become less chlorinated and consist mostly of mono- to tetrachlorobiphenyl.
- The MCL for PCBs is 0.5 ppb. Dissolved PCBs in groundwater >0.5 ppb are found at depth. For example, at PMA-GW-1, dissolved PCBs are >0.5 ppb at all depths. At PMA-GW-2, dissolved PCBs are >0.5 ppb at 20', 30', 40', and 50'. At PMA-GW-3, dissolved PCBs are >0.5 ppb at 30' and 50'. And at PMA-GW-4, dissolved PCBs >0.5 ppb are found at 20' and 60'. If data for the four wells is averaged, dissolved PCBs >0.5 ppb are found at all depths.
- Although there are interbedded clay layers within the 15' zone at each boring location, they do not appear to be an impediment for downward PCB migration. Total PCBs are present in sand beneath the clay layers and in some instances, are found in greater concentrations with depth (PMA-S-1 and PMA-S-4).

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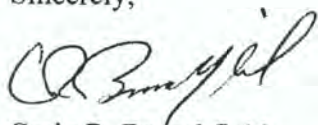
Mr. Kenneth Bardo
U.S EPA Region V
Corrective Action Section
Enforcement Compliance Branch
77 West Jackson Boulevard DE-J9
Chicago, IL 60604-3507

Re: W.G. Krummrich Plant
Enhanced Aerobic Bioremediation (EABR) Treatability Test Report for
the Saturated Shallow Hydrogeologic Unit
Response to EPA Comments

Dear Mr. Bardo,

Attached please find the Solutia's Response to EPA comments on the Enhanced Aerobic Bioremediation (EABR) Treatability Test Report for the Saturated Shallow Hydrogeologic Unit at the W.G. Krummrich Facility. Should you have any questions or concerns please contact me at (314) 674-6768.

Sincerely,



Craig R. Branchfield
Manager, Remedial Projects

GENERAL COMMENTS

1. The results from the EABR bench-scale test on saturated zone soil from the SHU were disappointing and significantly inferior to the bench-scale test conducted using the ISTD technology on soil from the same aquifer and site location. This conclusion is supported by the following test data:
 - The soil collected from the SHU (primarily fine silts and clays) was impermeable to water flow at the selected flow rate when first received in the laboratory. In order to initiate the test, the laboratory remixed the sample with 75 percent soil material from the SHU and 25 percent soil material from the underlying MHU/DHU (which contained considerably more sand and gravel). The fact that this action had to be performed to ensure water flow through a sample of aquifer material, coupled with the second cessation of flow due to low permeability in the test column in late October 2005, suggests that delivery of oxygen into the SHU sufficient to ensure adequate bioremediation will not be achievable in the field. In addition, the test was not truly representative of SHU conditions, because 25 percent of the material in the test column was from the MHU/DHU.
 - The total mass reduction of chlorobenzenes, as measured by analysis of pre-test and post-test soil samples, was approximately 45 percent for MCB and ranged between 15 percent and 23 percent for the DCB isomers. Mass reductions in the front (upstream) third of the test column were high; however, the measured masses actually increased in the middle third during the test, and mass reductions were much lower in the end (downstream) third, as summarized in Table 1.

Table 1: Mass Reduction of MCB and DCBs, EABR Saturated SHU Bench-Scale Test

Column Section	MCB	1,2-DCB	1,3-DCB	1,4-DCB
Front (upstream)	99.8%	96.2%	95.9%	96.6%
Middle	-8.6%	-66.7%	-56.3%	-50%
End (downstream)	43.1%	16.7%	18.8%	23%
Total Mass Reduction	45%	15%	19%	23%

This indicates that even after a 12-week test period, oxygen was apparently not migrating to the downstream portions of the column in amounts sufficient to stimulate significant biodegradation of chlorobenzenes. The increase in downstream mass in the middle third also indicates that significant flushing and transfer of mass (i.e., rather than destruction of mass) was occurring in the column; refer to the following bullet for a more in-depth discussion of flushing.

- Section 4.5 of the Report indicates that, based on oxygen consumption data, an estimated 12 percent of the total mass of chlorobenzenes removed during the test was due to biodegradation and the remaining 88 percent was due to flushing. As noted in the previous bullet, this could explain the increase in mass of MCB and DCBs within the middle portion of the column. Additional calculations in this section indicate that for total volatile organic compound (VOC) and semi-volatile organic compound (SVOC) concentrations above the 50th percentile (i.e., the median), 100 percent of mass removal would occur due to flushing, as compared to 42.2 percent for concentrations in the 25th to 50th percentile and 7 percent for concentrations below the 25th percentile. In combination, these data imply that chlorobenzene NAPLs (and possibly also high dissolved-phase concentrations) in the saturated SHU would be removed primarily through flushing. In the May 2006 Response to EPA's Comments on the EABR Treatability Test for the MHU/DHU Report, Solutia also raises the point that "since the May 26, 2004, CA750 Environmental Indicator Determination demonstrated that groundwater migration from the site was under control, continued flushing of MCB/DCBs from the source area will not adversely

impact the Mississippi River.” Notwithstanding the protection afforded to the river by the downgradient Groundwater Migration Control System (GMCS or slurry wall) at Site R, flushing contaminant mass from the source areas in large amounts is less desirable than destroying it in situ or removing it for ex-situ thermal destruction, which the ISTD technology would accomplish. In addition, this approach would be inconsistent with EPA’s 1996 Advanced Notice of Public Rule-making (ANPR) ¹, which expresses a preference for corrective measures that reduce the toxicity, mobility, and/or volume of contaminants in source materials.

As documented in the February 2006 ISTD Treatability Study Final Report submitted by Solutia, the ISTD bench-scale test performed on soil from the same aquifer and site location resulted in mass removals of 99.989 percent of MCB and 99.999 percent of all DCB isomers (compared to 45 percent of MCB and between 15 percent and 23 percent of DCBs during the EABR bench-scale test). Additionally, it should be noted that these ISTD results were realized at the lowest test temperature of 100 degrees Celsius. The EABR bench-scale test did indicate that significant consumption of the influent dissolved oxygen occurred (i.e., between 86 percent and 97 percent of the initial 48.6 milligrams per liter [mg/L] influent concentration) and that key bacterial populations increased by approximately two orders of magnitude during the 12-week test. Both of these results support a finding that biodegradation was occurring within the test system. Therefore, the EABR technology may be suitable for areas of the SHU with lower concentrations of dissolved phase chlorobenzenes (i.e., no DNAPLs) or as the follow-on process in a treatment train. Nevertheless, Solutia has not provided sufficient justification to proceed to an in-field pilot test of the EABR technology for the saturated SHU at the DNAPL-impacted Former Chlorobenzenes Process Area. Based on the bench-scale test results generated to date, we request that Solutia submit a work plan for an in-field pilot test of the ISTD technology in the saturated SHU at the Former Chlorobenzenes Process Area.

1) U.S. EPA, Corrective Action for Releases from Solid Waste Management Units at Hazardous Waste Management Facilities; Proposed Rule, Federal Register, 19431-64, May 1, 1996.

RESPONSE: Solutia agrees that an infield pilot test of the EABR technology for the unsaturated SHU is not warranted. Regarding the request for a pilot test of the ISTD technology in the SHU at the Former Chlorobenzene Process Area, Solutia believes it is important to note that the objective of the treatability and pilot test programs is to gather additional data specific to conditions at the WGK Facility so that these technologies may be more effectively evaluated in the Corrective Measures Study (CMS). Based on the results of the ISTD Treatability Test for the SHU and information available from the operation of this technology at other sites, Solutia believes that all information required to evaluate the ISTD technology in the context of a CMS is available. Solutia intends to formally present this rationale to USEPA in a subsequent work plan that will identify all data needs required to complete a Corrective Measures Study process. If the results of that analysis lead to a conclusion that Solutia is incorrect in its assessment of the suitability of data required to evaluate the ISTD technology in the CMS process, then we will propose alternatives to USEPA, including the possible performance of a pilot test, for collecting the additional data required.

2. The EABR bench-scale test for soil from the MHU/DHU included a control sample (i.e., a test column purged with nitrogen instead of oxygen and amended with a biocide to prevent biodegradation activity). From review of this Report, it is not apparent that a similar control column was set up and tested for the bench-scale test of saturated soil from the SHU. The purpose of the control sample is to investigate, and quantify if possible, attenuation of chlorobenzenes due to abiotic mechanisms (e.g., volatilization, sorption, dilution, hydrolysis). Solutia should clarify whether a control column was tested during the EABR bench-scale test on SHU soil, and if not, provide the rationale for omitting this test.

RESPONSE: A soil sample from the SHU was added to the MHU/DHU EABR Mass Removal Treatability Test in order to evaluate the feasibility of using this technology to treat saturated, fine-grained, low-permeability soils from the Shallow Hydrogeologic Unit in the Former Chlorobenzene Process Area. Since the SHU EABR Mass Removal Treatability Test was intended to supplement the MHU/DHU EABR

Mass Removal Treatability Test, an abiotic control column was not considered necessary.

3. Two significant issues were observed during the SHU treatability study that were not noted during the corresponding EABR bench-scale test on the MHU/DHU soil. First, negative reduction (i.e., an increase) was observed in MCB and DCB masses in the middle segment of the test column over the test period. Second, there were four weeks of no-flow conditions following three weeks of oxygenation, before the flow then resumed for the rest of the test period. The Report noted that the reasons for these observations were unclear. Furthermore, these problems were not encountered during the similar treatability study on MHU and DHU soil. Solutia should amend the Report to explain or theorize why these issues were noted during the SHU bench-scale test but not during the MHU/DHU test for the same technology.

RESPONSE: Typically the SHU is clayey and/or silty fine sand with a permeability of $1\text{E-}4$ cm/sec while the MHU and DHU are composed of fine to coarse sand with a permeability of $1\text{E-}1$ cm/sec. Using a clay and silt sample in the SHU EABR Treatability Test, even though it was amended with 25 percent sand, further increased the permeability contrast between the samples used for the two treatability tests. This permeability contrast is the most likely cause of the differences in constituent distribution in the test columns and the flow patterns observed in the SHU and MHU/DHU EABR Mass Removal Treatability Tests.

SPECIFIC COMMENTS

Section 1.0 Executive Summary

1. This section states that the total MCB/DCB mass removed from the saturated SHU treatability test column was 23 percent, based on soil sampling data indicating that the initial mass in the column was 3,140 mg and the residual mass in the column after 12 weeks of oxygen injection was 2,620 mg. A standard percent difference calculation $(3,140 - 2,620 / 3,140)$ indicates a mass removal of 16.6 percent. In addition, the text indicates that the total mass removed was 95 mg via biodegradation + 695 mg via flushing = 790 mg, which when added to 2,620 mg is equal to 3,410 mg total mass (not 3,140 mg). Solutia should check the applicable calculations and correct or clarify them as necessary.

RESPONSE: The initial MCB/DCB mass in the column was incorrectly reported as 3,140 mg rather than the actual initial mass of 3,410 mg. The initial mass of 3,410 mg is calculated using initial concentrations (see Table 4) of: 580 mg/kg MCB; 1,200 mg/kg 1,2-DCB; 320 mg/kg 1,3-DCB; 1,000 mg/kg 1,4-DCB, and a soil mass in the column of 1.1 kg.

Section 2.3.3 Column Preparation and Operation

2. On page 8 in this section, the flow rate through the test column is listed as 39.6 milliliters per minute (mL/min). This flow rate seems inconsistent with simulating a groundwater velocity of only 10 feet per year, and furthermore does not correspond to the flow rate given on page 21 of the Report (0.04 L/day). Solutia should clarify and correct the text as necessary to ensure that the correct flow rate is documented.

RESPONSE: The flow rate units were incorrectly reported on page 8, and should have been reported as mL/day. The flow rate was correctly reported on page 21 as 0.04 L/day (equivalent to 40 mL/day).

3. On page 8, under the heading *Sampling*, the text states that following initiation of oxygen addition, effluent samples were collected weekly from each column. If this is the case, discuss how four weeks of no-flow conditions following the first three weeks of oxygen addition persisted without being noticed.

RESPONSE: The four week period without flow did not go unnoticed. Besides the weekly sampling program, the columns were inspected regularly throughout the test for any problems. The flow problem in the SHU column was realized during the Week 4 sampling event when the sample reservoir did not fill with effluent. Upon this observation of no flow, all flow lines, valves, and column inlet and outlet were examined and tested for blockage. The pump was also tested to verify it was working properly. All components of the experimental set up were found to be working properly, indicating the blockage was within the column. As stated in the report, the column remained blocked for four weeks, although flow to the column was continuously attempted during this period. No samples were collected from the SHU column during these four weeks since the effluent sampling reservoir did not fill.

Section 3.1 Initial Soil Characterization Results

4. Due to deviations from historical maximum concentrations of MCB and DCBs in the SHU soils, the test samples were spiked with laboratory-grade MCB and DCBs to attempt to simulate those baseline historical concentrations. While the total DCBs concentration of the spiked sample was close to the historical maximum (2,520 mg per kilogram [kg] versus 2,950 mg/kg, a difference of approximately 15 percent), the MCB concentration of the spiked sample was considerably less than the historical maximum (580 mg/kg versus 1,600 mg/kg, or almost 64 percent lower). Solutia further states in this section that the 580 mg/kg concentration is generally representative of source zone concentrations measured throughout the saturated SHU at the Former Chlorobenzenes Process Area. Even if this is correct, the objective of the source zone treatment is to destroy the maximum amount of DNAPL possible from this zone in order to accelerate the remediation period for SHU groundwater. As Solutia's calculations from Appendix 10 of the Corrective Measures Study (CMS) indicate, a very large reduction in MCB/DCBs mass (greater than 90 percent) is necessary before appreciable reductions in dissolved-phase concentrations are predicted to be observed. Provide a discussion on whether any analytical techniques can be applied to predict the performance of the EABR technology if the starting concentration of MCB in the test were close or equal to the historical maximum of 1,600 mg/kg.

In addition, the text states on page 11 that results of spiked samples indicated that MCB/DCBs losses during the spiking process were negligible. The supporting data or basis for this statement was unclear. Solutia should either explain the basis for this statement or reference the data supporting this statement.

RESPONSE: Appendix 10 of the CMS predicts a proportional relationship between mass reduction and concentration reduction (i.e., 90 percent mass removal will result in a 90 percent concentration reduction). Performance of the EABR technology, in terms of percent MCB biodegraded, is dependent upon the oxygen delivery rate and mass of contaminant. Since the oxygen delivery rate is independent of the initial MCB concentration, the mass reduction due to biodegradation would have been less had the initial MCB concentration been 1,600 mg/kg.

SHU soil was spiked with three mixtures of laboratory grade MCB/DCB. The mixtures were at one, two, and three times the calculated mass necessary to achieve the historical target concentrations. Three "strengths" of MCB/DCB were used since there was concern that significant loss of MCB/DCB could occur during the spiking and mixing process. The statement that MCB/DCB loss during the spiking process was negligible is based on the fact that the 1x mixture of MCB/DCB was sufficient to achieve concentrations equal to or greater than the historical target concentrations (see the table on page 10 of the report).

Section 4.5 Mass Removal Mechanisms

5. On page 22 in this section, the following statement is made: "MCB/DCB concentrations in column effluent indicate that sorption was not a likely abiotic removal mechanism." No supporting discussion is provided. The Report should be amended to explain the above statement. In addition, sorption is often not considered to be a removal process because it represents a temporary

equilibrium state that can be reversed if aquifer conditions change, thus leading to dissolution of the sorbed compound(s).

RESPONSE: The effluent MCB/DCB concentration profile was relatively constant over the last several weeks of the test, which is consistent with final soil sampling results indicating elevated MCB/DCB mass remaining at the end of the column at the conclusion of the test. Had sorption been a mass removal process (rather than an equilibrium partitioning process as pointed out in the comment) then the effluent concentration profile would have showed a continued decrease over time.

6. The text states that the mass removal achieved in the front portion of the column would likely have been achieved in the middle and end portions had the experiment been extended. This statement is not supported by the asymptotic effluent level of oxygen and increase in the MCB and DCBs concentrations in the middle portion of the column during the 12-week test. Solutia should provide the rationale for its assertion that an extended treatability test would result in increased mass removal.

RESPONSE: Biotic degradation of MCB/DCB during the SHU EABR Mass Removal Treatability Test was dependent upon the amount of oxygen delivered to the soil column. For this reason, the longer the test was conducted, the greater the mass of oxygen delivered to the test column and the greater the mass removal by biodegradation. Microbiological data showing increases in the number of bacteria and sampling data showing greater than 95% MCB/DCB removal in the front of the column demonstrate that the oxygen front moved through the first two inches of the soil column over the 12 week duration of the SHU treatability test. The oxygen front did not move through the next two inches of test column because the short duration of the treatability test did not allow enough time for the oxygen demand in this portion of the column to be met. However, consistently low dissolved oxygen concentrations in the column effluent demonstrated that oxygen was being consumed within the column throughout the treatability test. Under these conditions, continuation of the treatability test would allow the oxygen front to proceed along the column until all the contaminant mass was exhausted. At this point, oxygen break through would occur at the end of the column.

7. The calculations presented on pages 21 and 22 of the Report assumed that all available dissolved oxygen within the soil matrix was being consumed through the biodegradation of MCB and DCBs. The soil will likely contain other sources of electron donors (e.g., naturally occurring organic carbon, other contaminants) that would compete with MCB/DCBs for dissolved oxygen. Solutia should clarify its calculations and discuss the expected impact of other electron donors on the dissolved oxygen available for biodegradation of chlorobenzenes in the SHU.

RESPONSE: The calculations of mass removal from the columns assumed that all oxygen was utilized by MCB/DCB biodegradation because: i) initial sampling results indicated that the only other detected contaminant (1,2,4-trichlorobenzene) was present at a concentration of 17.5 mg/kg, representing only 0.5% of the total contaminant mass; and ii) naturally occurring organic carbon is expected to be present at insignificant levels relative to the MCB/DCB mass.

When column results were extrapolated to predict the contribution of biodegradation versus flushing at the site, other contaminants were accounted for through the use of total VOC and SVOC concentrations (rather than only MCB/DCB concentrations) measured at the site.